Specification

JOHN ADAMS ELEMENTARY SCHOOL
KITCHEN RENOVATION

5651 Rayburn Avenue, Alexandria, Virginia  22311

PE Project #72641.00.0

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INTRODUCTORY INFORMATION

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*PEA - include roofing repairs section once know existing roof system*

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NOT USED

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NOT USED

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NOT USED

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PART 1 - GENERAL

1.01 REFERENCE REQUIREMENTS

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 SCOPE OF PROJECT

A. The project consists of the renovation of the Kitchen, Cafetorium, and associated spaces at Alexandria City Public Schools’ John Adams Elementary School. Typical interior finish work includes painting, ceramic tile, resilient flooring, and acoustical tile ceilings. Included is the addition of a ramp in the Cafetorium. Included is food service, structural, plumbing, mechanical, and electrical work.

1.03 PROJECT SCHEDULE

A. The Contractor will receive a NTP (Notice to Proceed) as soon as approved by the School Board in March 2020. Access to the work area shall be provided to the Contractor starting April 4, 2020; with the exception of the Cafeteria and Stage Toilets. Access to the Cafeteria, wall between Cafeteria and Kitchen, and Stage Toilets work areas shall be provided to the Contractor starting June 20, 2020. The Work shall be Substantially Complete by August 7, 2020 and Final Completion shall occur on or before August 21, 2020.

1.04 OCCUPANCY REQUIREMENTS

A. Partial Owner Occupancy: The Owner reserves the right to occupy and to place and install equipment in completed areas of the building prior to Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.

1. The Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner occupancy.

2. Obtain a Certificate of Occupancy from local building officials prior to Owner occupancy.

3. Prior to partial Owner occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy, the Owner will operate and maintain mechanical and electrical systems serving occupied portions of the building.
4. Upon occupancy, the Owner will assume responsibility for maintenance and custodial service for occupied portions of the building.

1.06 CONTRACTOR USE OF PREMISES

A. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated. Refer to Division 1 Section Site Procedures and Controls for required and restricted access.

B. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.07 OWNER OCCUPANCY

A. Partial Owner Occupancy: The Owner will occupy the school building during the entire construction period. Cooperate with the Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with the Owner's operations.

B. Observe the following construction and storage limitations:

1. Control dust, debris, vapors, fumes, and gases within the construction area and keep same out of owner occupied areas.

2. Control noise within the construction and occupied areas.

3. Insure non-interruption of utilities and services, i.e. power, HVAC, etc. to occupied areas. Necessary outages for equipment change out shall occur only during unoccupied periods, as coordinated with the Owner.

4. Restrict access for material delivery and debris removal to designated construction entrances.

5. Storage of material shall only be permitted within the designated construction area. Do not exceed floor or roof loading limits.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION 01 10 00
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. This Section includes administrative and procedural requirements governing allowances.
   1. Certain materials and equipment are specified in the Contract Documents by allowances. In some cases, these allowances include installation. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:
   1. Lump-sum allowances.

1.03 SELECTION AND PURCHASE
A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.04 SUBMITTALS
A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.02 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.03 SCHEDULE OF ALLOWANCES

A. Allowance #1: Include in the base bid the cost to replace forty (40) 2x4 ceiling tiles in existing corridors with new 2x4 ceiling tiles. Basis-of-design: “School Zone Fine Fissured” Item 1811 by Armstrong World Industries; other acceptable product is “USG Fissured Basic Acoustical Panels” Item 586 by USG Interiors, Inc. Refer to Section 09 51 13.

END OF SECTION 01 21 00
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DESCRIPTION

A. Definition: An Alternate is an amount proposed by Bidders and stated on the Bid Form for certain construction activities defined in the Bidding Requirements that may be added to the Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems or installation methods described in Contract Documents.

B. Coordination: Coordinate Related Work and modify or adjust adjacent Work as necessary to ensure that Work affected by each accepted Alternate is complete and fully integrated into the project at no additional cost to that proposed on the Bid Form.

C. Notification: Immediately following the award of the Contract, prepare and distribute to each party involved notification of the status of each Alternate. Indicate whether Alternates have been accepted, rejected or deferred for consideration at a later date.

D. Bidder-originated Alternates or qualifying statements will not be considered.

1.3 SCHEDULE OF ALTERNATES

A. Specification Sections referenced in the Schedule contain requirements for materials and methods necessary to achieve the Work described under each Alternate. Include as part of each Alternate, miscellaneous devices, accessory objects and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

B. List of ADD Alternates:

1. Alternate #1 – Stage Toilets: Renovate Toilet Rooms #160B and #160C, including all architectural, structural, plumbing, mechanical, and electrical work.


4. Alternate #3 – Pressure Washer in Janitor Closet #TA: Provide pressure washer assembly (kitchen equipment item number 54a), including all architectural, plumbing, and electrical work.
5. Alternate #4 – Wall Graphic in Serving Area: Provide wall graphic in Serving #161A.
6. Alternate #5 – Wall Graphic in Cafeterium: Provide wall graphic in Cafeterium #160.

END OF SECTION 01 23 00
PART 1 - GENERAL

1.01 DESCRIPTION

A. Substitutions:
   1. Prebid requests for product and material substitutions shall be received in writing by the Architect for approval a minimum of ten (10) days prior to receipt of bids.

B. Products not considered substitutions:
   1. Revisions to Contract Documents requested by the Owner or Architect.
   2. Specified or listed acceptable product options and alternative construction methods indicated in Contract Documents.
   3. Revisions to Contract Documents required to conform with governing regulations and orders issued by governing authorities.

C. Submittal requirements
   1. Requests for substitution must be submitted in writing. Requests for substitution shall not be submitted by facsimile ("faxed").
   2. Submit three (3) copies of "Request for Substitution" cover letter with the following information:
      a. Project Name, today's date, Firm/Manufacturer's name with street, address and phone no., Bid Date
      b. Referenced section of project specifications
      c. Proposed product
      d. Brief description of proposed request for substitution listing any required changes to other parts of the work necessary to accommodate proposed substitution.
      e. Estimated savings or cost increase over specified product(s), including cost of changes to other parts of the work required to accommodate proposed substitution.
      f. Impact on construction schedule
      g. Submit separate cover letters for each "Request for Substitution."
   3. Submit three (3) photocopies of referenced section of project specifications with paragraph by paragraph comparison of specified product and proposed substitution product listed on attached sheets of similar format.
   4. Manufacturer's descriptive literature, copy of guarantee and recommended installation instructions for proposed substitution product.
   5. Product samples if requested by Architect. Bidders shall call Architect to determine if samples are required.
   6. If requested by the Architect as a means of determining whether or not a material or item submitted by the Contractor is equal to the standards established by the Contract Documents, the Contractor shall submit data for both the specified and proposed item or materials in the form of engineering data or calculations; results of tests conducted by the independent testing laboratories; experience records of the material or equipment used under conditions similar to that proposed in the Project; any other means required by the Architect to establish the fact that the
proposed item is equal to the specified. The furnishing of all such data will be at the expense of the Contractor and without cost to the Owner.

D. The Architect shall evaluate all information submitted and recommend to Owner acceptance or rejection of request for substitution. Incomplete submittals will not be considered. Owner will make final decision. If proposed substitution is accepted, bidders will be notified by means of an Addendum to the Contract. If a decision on a request for substitution cannot be made or obtained before receipt of bids, bidders must use the product(s) specified by name.

E. The Contractor is responsible for identifying and implementing all requirements, material process or otherwise, which are affected by permissible substitutions or deviations from products or assemblies described in the Contract Documents.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 01 25 00
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. This Section specifies administrative and procedural requirements for handling and processing contract modifications.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Allowances" for procedural requirements governing the handling and processing of allowances.
2. Division 1 Section "Submittals" for requirements for the Contractor's Construction Schedule.
3. Division 1 Section "Product Substitutions" for administrative procedures for handling requests for substitutions made after award of the Contract.

1.03 MINOR CHANGES IN THE WORK

A. The Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or Contract Time, on AIA Form G710, Architect's Supplemental Instructions.

1.04 CHANGE ORDER PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: The Architect will issue a detailed description of proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal requests issued by the Architect are for information only. Do not consider them as an instruction either to stop work in progress or to execute the proposed change.

2. Within 14 days of receipt of a proposal request, submit an estimate of cost necessary to execute the change to the Architect for the Owner's review.
   a. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
   b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
   c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.
B. Contractor-Initiated Proposals: When latent or unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Architect.
   1. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.
   2. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
   3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
   4. Comply with requirements in Section "Product Substitutions" if the proposed change requires substitution of one product or system for a product or system specified.


1.05 ALLOWANCES

A. Allowance Adjustment: For allowance-cost adjustment, base each Change Order Proposal on the difference between the actual purchase amount and the allowance, multiplied by the final measurement of work-in-place. Where applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
   1. Include installation costs in the purchase amount only where indicated as part of the allowance.
   2. When requested, prepare explanations and documentation to substantiate the margins claimed.
   3. Submit substantiation of a change in scope of work claimed in the Change Orders related to unit-cost allowances.
   4. The Owner reserves the right to establish the actual quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or the Contractor's handling, labor, installation, overhead, and profit. Submit claims within 21 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. The Owner will reject claims submitted later than 21 days.
   1. Do not include the Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in Contract Documents.
   2. No change to the Contractor's indirect expense is permitted for selection of higher or lower-priced materials or systems of the same scope and nature as originally indicated.

1.06 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: When the Owner and the Contractor disagree on the terms of a Proposal Request, the Architect may issue a Construction Change Directive.
The Construction Change Directive instructs the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. The Construction Change Directive contains a complete description of the change in the Work. It also designates the method to be followed to determine change in the Contract Sum or Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
   1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.07 CHANGE ORDER PROCEDURES

A. Upon the Owner's approval of a Proposal Request, the Architect will issue a Change Order for signatures of the Owner and the Contractor on AIA Form G701.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 26 00
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. This Section includes administrative and supervisory requirements necessary for coordinating construction operations including, but not necessarily limited to, the following
   1. General project coordination procedures.
   2. Coordination Drawings.
   4. Administrative and supervisory personnel.
   5. Cleaning and protection.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 1 Section "Field Engineering" specifies procedures for field engineering services, including establishment of benchmarks and control points.
   2. Division 1 Section "Project Meetings" for progress meetings, coordination meetings, and preinstallation conferences.
   3. Division 1 Section "Submittals" for preparing and submitting the Contractor's Construction Schedule.
   4. Division 1 Section "Materials and Equipment" for coordinating general installation.
   5. Division 1 Section "Contract Closeout" for coordinating contract closeout.

1.03 COORDINATION

A. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend on each other for proper installation, connection, and operation.
   1. Prepare and publish detailed coordination drawings, incorporating input from every trade, prior to commencing the work.
   2. Schedule construction operations in the sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   3. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
   4. Make provisions to accommodate items scheduled for later installation.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of schedules.
   2. Preparation of coordination drawings.
   4. Delivery and processing of submittals.
   5. Progress meetings.
   6. Project closeout activities.

D. Conservation: Coordinate construction operations to assure that operations are carried out with consideration given to conservation of energy, water, and materials.
   1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work.

1.04 COORDINATION DRAWINGS

A. Coordination Drawings: Contractor shall supervise and direct the development of computer-generated coordination drawings showing comprehensive coordination and integration of all Work of this project including, but not limited to, structural, architectural, mechanical, plumbing, fire protection, and electrical disciplines.
   1. Show the relationship of components shown on separate Shop Drawings.
   2. Indicate required installation sequences.
   3. Comply with requirements contained in Section "Submittals."

B. Coordination drawings are intended to assist the Contractor and all trades during construction and may be used to supplement shop drawings, record drawings, and other required submittals.

C. Base Sheets: Architect will provide Contractor with computer-generated drawing files or "backgrounds", from which Contractor shall prepare and provide one accurately scaled set of building coordination drawing files or "Base Sheets" showing coordination of architectural and structural work.

D. Technical Requirements for Coordination Drawings: Each of the following trades providing input to coordination drawing Base Sheets supplied by Contractor shall comply with the following procedures. Subcontractor shall accurately and neatly plot, using CAD equipment compatible with that of the Contractor, the actual size and location of all applicable equipment and Work under its jurisdiction. Subcontractor shall note any apparent conflicts, suggest alternate solutions, and return the coordination drawings to the Contractor in accordance with established schedule for this work. Plot critical areas at 1/2" = 1'-0", and supplement with isometric views when necessary.

E. Structural Items: Indicate all structural members which affect clearances for other work. Show depth of member, and height above floor, or clearance above ceiling, as appropriate. Verify all dimensions by field measurements.

F. Mechanical Items: Prepare floor plans and reflected ceiling plans, elevations, sections, and details to conclusively coordinate and integrate the installation of all equipment, piping and
ductwork. Show actual size of each item, and clearance required for operation and maintenance. Indicate locations where sequencing and coordination of installations are of importance to the efficient flow of the Work.

G. Arrange for chases, slots, and openings in other building components to allow for mechanical installations.

H. Sequence, coordinate and integrate installation of materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in and finish operations.

I. Contractor's Review and Submission Control: Carefully review and coordinate the circulated coordination drawings in cooperation with affected subcontractors to ensure conflicts, if any, are resolved prior to commencement of field work, and to ensure that locations of work exposed to view are as indicated or as reviewed by Architect. Submit coordination drawing originals to Architect for review following specified procedures and policies outlined in Section 01340. Final plots of coordination drawings shall be at 1/4" = 1'-0" scale, except that congested areas and vertical sections through parts of the building shall be at 1/2" = 1'-0" scale.

1.05 SUBMITTALS

A. Staff Names: Within 15 days of receipt of Notice to Proceed, submit a list of the Contractor's principal staff assignments, including the superintendent and other personnel in attendance at the Project Site. Identify individuals and their duties and responsibilities. List their addresses and telephone numbers.

1. Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.

B. Subcontractor List: Within 15 days of Notice to Proceed, submit proposed list of subcontractors to be engaged in the work.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 GENERAL COORDINATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

3.02 CLEANING AND PROTECTION

A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.
B. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.

C. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:
   1. Excessive static or dynamic loading.
   2. Excessive internal or external pressures.
   3. Excessively high or low temperatures.
   4. Thermal shock.
   5. Excessively high or low humidity.
   6. Air contamination or pollution.
   7. Water or ice.
   8. Solvents.
   10. Light.
   11. Radiation.
   12. Puncture.
   13. Abrasion.
   14. Heavy traffic.
   15. Soiling, staining, and corrosion.
   16. Bacteria.
   17. Rodent and insect infestation.
   19. Electrical current.
   20. High-speed operation.
   21. Improper lubrication.
   22. Unusual wear or other misuse.
   23. Contact between incompatible materials.
   24. Destructive testing.
   25. Misalignment.
   26. Excessive weathering.
   27. Unprotected storage.
   28. Improper shipping or handling.
   29. Theft.
   30. Vandalism.

END OF SECTION 01 31 00
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION

A. Work included: To enable orderly review during progress of the Work, and to provide for systematic discussion of problems, the Architect will conduct project meetings throughout the construction period.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. The Contractor's relations with his Subcontractors and materials suppliers, and discussions relative thereto, are the Contractor's responsibility and normally are not part of project meetings content.

1.03 QUALITY ASSURANCE

A. For those persons designated by the Contractor to attend and participate in project meetings, provide required authority to commit the Contractor to solutions agreed upon in the project meetings.

1.04 SUBMITTALS

A. Agenda items: To the maximum extent practicable, advise the Architect at least 24 hours in advance of project meetings regarding items to be added to the agenda.

B. Minutes:
   1. The Architect will compile minutes of each project meeting, and will furnish electronic copies to the Contractor and Owner within seven (7) days following the date of each meeting.

1.05 MEETING SCHEDULE

A. Except as noted below for Preconstruction Meeting, regularly scheduled project meetings will be held every two weeks. The Owner reserves the right to schedule additional project meetings, as necessary to maintain the progress of the Work.

B. Coordinate as necessary to establish mutually acceptable schedule for meetings.
1.06 MEETING LOCATION
A. The Owner will establish meeting location. To the maximum extent practicable, meetings will be held at the project job site.

1.07 PRECONSTRUCTION MEETING
A. Preconstruction Meeting will be scheduled by the Owner after award of Contract.
   1. Provide attendance by authorized representatives of the Contractor and major Subcontractors.
      a. The Architect will advise other interested parties, including the engineers, consultants, and Owner, and request their attendance.

B. Minimum agenda: Data will be distributed and discussed on at least the following items.
   1. Organizational arrangement of Contractor's forces and personnel, and those of the Subcontractors, materials suppliers and Architect.
   2. Channels and procedures for communication.
      a. Construction schedule, including sequence of critical work.
      b. Contract Documents, including distribution of required copies of original Documents and revisions.
      c. Processing of Shop Drawings and other data submitted to the Architect for review.
      d. Processing of Bulletins, field decisions, and Change Orders.
      e. Rules and regulations governing performance of the Work; and
      f. Procedures for safety and first aid, security, quality control, housekeeping, and related matters.
      g. Contractor's requests for information from the Architect.
      h. Other applicable items as requested or suggested by the Contractor, Architect or Owner representatives.
   3. Sustainable design requirements.
   4. IAQ construction requirements.
   5. Construction waste management requirements.
   6. Establishment of Notice to Proceed date.

1.08 PROJECT MEETINGS
A. Attendance:
   1. To the maximum extent practicable, assign the same person or persons to represent the Contractor at project meetings throughout the progress of the Work.
   2. Subcontractors, materials suppliers, and others may be requested and required to attend those project meetings in which their aspect of the Work is involved.

B. Minimum agenda:
   1. Review, revise as necessary, and approve minutes of previous meetings.
   2. Review progress of the Work since last meeting, including status of submittals for approval.
   3. Identify problems which impede planned progress.
   4. Develop corrective measures and procedures to regain planned schedule.
   5. Review schedule, and two week look-behind and look-ahead for the Work.
   7. Sustainable design requirements.
8. IAQ construction progress.
10. Complete other current business.
11. Use of premises

C. Revisions to minutes:

1. Unless published minutes are challenged in writing prior to the next regularly scheduled progress meeting, they will by accepted as properly stating the activities and decisions of the meeting.
2. Persons challenging published minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.
3. Challenge to minutes shall be settled as priority portion of "old business" at the next regularly scheduled meeting.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 31 15
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. General: This Section specifies administrative and procedural requirements for the critical path method (CPM) of scheduling and reporting progress of the Work.

1. Refer to General Conditions and the Agreement, for definitions and specific dates of Contract Time.
2. The Submittal Schedule is included in Division 1 Section Submittals.
3. The Contractor and subcontractors shall assist in the development of the network plan and schedule to meet contract requirements.

1.03 DEFINITIONS

A. Critical path method (CPM) is a construction scheduling technique using network analysis diagrams to plan and organize construction activities in an orderly manner along the critical path.

B. Network: A network diagram is a graphic representation showing the relationship of activities and events in the correct sequences required to complete the Project within the Contract Time.

C. Activity:

1. An activity is any single identifiable step in the Project; it depends upon and cannot begin until completion of all preceding activities.
2. Critical activities are activities with no (zero) float time and are, therefore, operations that determine the critical path and control Project completion.

D. Event: An event is the starting or ending point of an activity and occurs only when all preceding activities have been completed.

E. Float time is the amount of time available for a given activity in excess of its estimated duration. It represents the amount of leeway available in scheduling an activity.

1. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
2. Total float is the amount of time an activity can be delayed without adversely affecting overall time for Project completion.
1.04 CONTRACTOR'S REPRESENTATIVE

A. The Contractor shall designate an authorized representative in his firm who will be responsible for assisting in the preparation of the network diagram and review/report progress of the project with Owner’s representative. The Contractor's representative shall have direct project control and complete authority to act on behalf of the Contractor in fulfilling requirements of this section of the specification and such authority will not be interrupted throughout the duration of the project.

1.05 CONTRACTOR'S CONSTRUCTION SCHEDULE (Network Analysis Schedules)

A. The Contractor shall prepare and maintain a detailed, cost loaded progress schedule as described below. This schedule shall be the Contractor's working schedule and used to plan, organize and execute the work, record and report actual performance and progress, and show how the Contractor plans to complete all remaining work as of the end of each progress report period. The schedule shall be in the form of an activity oriented network diagrams (Critical Path Method) and the principles and definition of the terms used herein shall be as set forth in "The Use of CPM in Construction – A Manual for General Contractors and the Construction Industry", The Associated General Contractors of America (AGC), Washington, DC, 1976 edition or "CPM in Construction Management", James O'Brien, McGraw-Hill Book Company, New York, New York, 1984, third edition. In the event of discrepancies, this section shall govern the development and utilization of the progress schedule.

1.06 QUALITY ASSURANCE

A. Scheduler: Specializing in CPM scheduling with five years 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: Five years minimum experience in using and monitoring CPM schedules on comparable projects.

C. Program: Use a computer software program for network analysis that has been developed specifically to manage CPM construction schedules and is acceptable to the Architect and/or Owner.

1.07 PRELIMINARY CONSTRUCTION SCHEDULE

A. Preliminary Network Diagram: Within 14 days of the date established for commencement of the work either by Letter of Intent or Notice to Proceed, whichever is earlier, submit a preliminary network diagram outlining activities for Phase 1 of construction.

1. Include each significant construction activity. Coordinate each activity in the network with other activities. Schedule each construction activity in proper sequence.

B. Tabulation of Submittals: With submittal of the preliminary network diagram, include a tabulation by date of submittals required during the first 90 days of construction. List
those required to maintain orderly progress of the Work, and those required early because of long lead time for manufacture or fabrication.

C. Distribution: Provide 1 copy to the Architect and three copies to the Owner. Also distribute the preliminary network diagram to subcontractors and suppliers that need to know about the timing of these construction activities.

1.08 CPM SCHEDULE - DETAILED NETWORK DIAGRAM

A. Complete development of the detailed CPM schedule and network diagram and submit no later than 30 days after the date established for commencement of the work either by Letter of Intent or Notice to Proceed, whichever is earlier.

B. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method, under concepts and methods outlined in the above referenced books.

C. The Detailed Network Diagram shall illustrate order and interdependence of activities and sequence of work, restrictions of access and availability of work areas, how the start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.

D. Proceed with preparation of the network diagram immediately following notification of Contract award.

E. Illustrate complete sequence of construction by activity, identifying work of separate floors. Provide dates for submittals including those for Owner furnished items, if any, and return of submittals, dates for procurement and delivery of products, and dates for installation and provision for testing. Provide legend for symbols and abbreviations.

F. The Detailed Network Diagram shall provide sufficient detail and clarity of form and technique so that the Contract can plan, schedule, and control his work properly and the Owner can readily monitor and follow the progress for all portions of work. The Detailed Network Diagram shall comply with the various limits imposed by the scope of work and by a contractually specified intermediate milestone dates included in the contract.

G. The following factors shall be addressed in the network:

1. The structural breakdown of the project
2. The type of work to be performed and the labor trades involved
3. All purchase, manufacture and delivery activities for all major materials and equipment
4. Deliveries of Owner furnished equipment
5. Preparation and processing of submittals
6. Preparation and approval of coordination drawings
7. Plans for all subcontract work
8. Access and availability of work areas
9. Testing, submission and approval of test results
10. Close-in inspections/correction of deficiencies
11. Testing/balancing of systems
12. Demonstrations and instructions
13. Punchlist inspection/correction of deficiencies

H. Activity durations over 21 working days shall be kept at a minimum except in the case of non-construction activities such as procurement of materials and delivery of equipment.

I. The estimated cost to perform each work activity shall be noted graphically on each activity included in the network. The sum of the costs assigned shall equal the contract value. No activity costs are to be assigned to manufacture or delivery schedules.

J. The network shall clearly indicate the intermediate milestone events, the contract completion dates, substantial completion and final acceptance dates and the predicted status of these control points as the networks are updated. All networks shall show a continuous flow from left to right with no arrows from right to left. The primary path(s) of criticality shall be clearly and graphically identified on the network. The status of the work in progress shall also be similarly identified on the network. The status of the work in progress shall also be similarly identified and the reported percent complete graphically indicated for the last report period. Logic ties between difference segments of the network shall be designated as remote "dummies", "from (event number), page ____" or equivalent designation.

K. Follow the steps necessary to complete development of the network diagram in sufficient time so that the CPM schedule can be submitted and accepted for use no later than 30 days after commencement of the Work.

L. Establish procedures for monitoring and updating the CPM schedule and for reporting progress; coordinate procedures with progress meeting and payment request dates.

1.09 CPM SCHEDULE - TABULAR PRINTOUTS

A. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates and identifying for each activity:

1. Preceding and succeeding event numbers
2. Activity description
3. Earliest start date
4. Earliest finish date
5. Actual start date
6. Actual finish date
7. Latest start date
8. Latest finish date
9. Total and free float
10. Monetary value of activity, keyed to Schedule of Values
11. Percentage of activity completed and remaining duration of activity
12. Identify each activity with applicable specification section number

B. Computer Outputs: Required as part of the initial schedule submission and each update thereafter. Outputs 1 through 3 below shall include all project activities.

1. Activity sort by event number from lowest to highest.
2. Activity sort by early start date and for same early start dates from lowest to highest event number.
3. Activity sort by amount of float and for equal amounts of float from lowest to highest event number.
4. Contractor's periodic payment request sorted in same manner as the Schedule of Values listings.

1.10 SUBMITTALS

A. The Detailed Progress Schedule (logic diagrams and computations) shall be submitted to the Owner and Architect for acceptance within thirty (30) calendar days after notice to proceed in the following quantities:
   1. Detailed Network Diagrams, 24” high x 36” wide and have a titleblock in the lower right hand corner.
   2. Tabular Printouts (3 copies to Owner and 3 copies to Architect - 8-1/2” x 11” in size).
   3. Written certification that major subcontractors have reviewed and accepted proposed schedule.

B. The Owner and Architect shall accept or reject the Contractor's submission within fifteen (15) calendar days after receipt of all required information.

C. If the Contractor fails to submit the Preliminary Construction Schedule, Detailed Network Diagrams, and Tabular Printouts within the time prescribed, or revisions thereof within the requested time, the Owner may withhold approval of progress payments until such time as the Contractor submits the required information.

D. At the request of the Owner or his authorized representative, the Contractor shall be required to participate in any meetings necessary to reach a mutual agreement and acceptance of the Detailed Network Diagram.

E. Submit updated Detailed Network Diagrams and Tabular Printouts with each Application for Payment.

F. If any of the required submissions are returned to the Contractor for corrections or revisions, they shall be submitted for acceptance within ten (10) calendar days after return mailing date. Resubmittal shall be in the same quantities as noted above. Review and response by the Architect and Owner within ten (10) days after each submission.
   1. Post copies in the Project meeting rooms and temporary field office.
   2. When revisions are made, Distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.
   3. Submit copies of each computer-produced report (listing) in triplicate to both the Architect and Owner.

1.11 REVIEW AND EVALUATION

A. Participate in joint review and evaluation of network diagrams with Owner and Architect.

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.

1.12 UPDATING SCHEDULES

A. The initial updating shall take place during the first week after the acceptance of the Contractor's schedule by the Owner and Architect and subsequent updates with each request for payment thereafter for the duration of the contract.

B. Identify activities modified since previous submittal, major changes in Work and other identifiable changes.

C. Indicate changes required to maintain Date of Completion.

D. Submit sorts required to support recommended changes.

E. If the Contractor fails to timely submit any of the update deliverables, the Owner may withhold approval of progress payment estimates until such time as the Contractor submits the required update reports.

F. Change Orders, Delays, and Time Extensions

1. When change orders or delays are experienced, the Contractor shall submit to the Owner or his authorized representative, a written Time Impact Analysis illustrating the influence of each change or delay of the current contract schedule completion dates. Each Time Impact Analysis shall include a fragnet (network analysis) demonstrating how the contractor proposes to incorporate the change order or delay into the Detailed Network Diagram. Additionally, the analysis shall demonstrate the time impact based on the date the change is given to the Contractor, the status of construction at that point in time, and the event time computation of all affected activities. The event times used in the analysis shall be those included in the latest update copy of the detailed progress schedule or as adjusted by mutual agreement.

2. Time extensions will be granted only to the extent that the equitable time adjustment for the activities affected exceed the total or remaining float along the path of activities at the time of actual delay or at the time notice to proceed was issued for the change. Each Time Impact Analysis shall be submitted in triplicate and within fifteen (15) calendar days after a delay occurs or notice of direction for a change is given to the Contractor. In cases where the Contractor does not submit a Time Impact Analysis for a specific change order or delay within a specified period of time, he shall be deemed to have irrevocably waived his rights to any additional time and cost. Approval or rejection of each Time Impact Analysis by the Owner shall be made within fifteen (15) calendar days after receipt of each Time Impact Analysis unless subsequent meetings and negotiations are necessary. Upon approval, a copy of the Time Impact Analysis signed by the Owner shall be returned to the Contractor. Upon mutual agreement by both parties, fragnets illustrating the influence of change order and delays will be incorporated into the Detailed Network Diagram during the first update after agreement is reached.

3. In the event the Contractor does not agree with the decision of the Owner regarding the impact of a change delay, it shall be resolved in accordance with the disputes clause of the contract.
1.13 DISTRIBUTION

A. Following joint review, distribute copies of updated schedules to Contractor's project site file, to Subcontractors, suppliers, Architect, Owner and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

1.14 SCHEDULE OF VALUES

A. Prepare schedule of values in coordination with preparation of construction schedule.

B. Itemized Data:

1. Provide itemization of Contract Sum in sufficient detail to facilitate continued evaluation of payment requests and progress reports.
2. Itemize principal subcontract amounts into separate labor and material items.
3. Round off figures to nearest whole dollar, but make total equal Contract Sum.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION (Not Applicable).

END OF SECTION 01 31 50
PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: Make submittals required by the Contract Documents to the Architect, and revise and resubmit as necessary to establish compliance with the specified requirements.

B. Related Work:
   1. Individual requirements for submittals also may be described in pertinent Sections of these Specifications.

C. Work not included:
   1. Submittals not required will not be reviewed by the Architect.
   2. The Contractor may require his Subcontractors to provide drawings, setting diagrams, and similar information to help coordinate the Work, but such data shall remain between the Contractor and his Subcontractors and will not be reviewed by the Architect.

1.02 QUALITY ASSURANCE

A. Coordination of submittals:
   1. Prior to each submittal, carefully review and coordinate all aspects of each item being submitted.
   2. Verify that each item and the submittal for it conform in all respects with the specified requirements.
   3. Verify that each item complies with Division 1 Sections "Sustainable Design Requirements," "Construction Waste Management and Disposal," and "Indoor Air Quality Requirements."

B. Verify all field measurements and conditions prior to submission.

C. By affixing the Contractor's signature to each submittal, certify that this coordination has been performed.

D. Each drawing submittal shall be certified by the Contractor with the following stamp:

"This is to certify that the Contract Document requirements have been met and all dimensions, conditions and quantities are verified as shown and/or corrected on these drawings."

Signed for
Contractor ____________________________
1.03 SUBMITTALS

A. Make submittals of Shop Drawings, Samples, and other items in accordance with the provisions of this Section.

PART 2 - PRODUCTS

2.01 SHOP DRAWINGS

A. Scale and measurements: Make Shop Drawings accurately to a scale sufficiently large to show all pertinent aspects of the item and its method of connection to the Work.

B. Drawings:
   1. Submit Shop Drawings electronically.
   2. Unless absolutely necessary, the size of Shop Drawings shall not exceed 24" x 36". Provide space on all Drawings for approval stamps and brief review comments.

C. Review comments of the Architect will be shown on the shop drawings when it is returned to the Contractor. The Contractor may make and distribute such copies as are required for his purpose.

2.02 MANUFACTURERS' LITERATURE

A. Manufacturers' data shall be defined to include, but not be limited to, catalogue cuts, technical descriptive brochures, performance charts, test reports, writing diagrams, details, specifications, and other literature or bulletins issued or provided by the product manufacturers. Data shall be submitted electronically. Upon receipt, the Architect will mark corrections and return the submitted data to the Contractor. If resubmittal is necessary, repeat process until approval has been obtained.

B. Manufacturers' data for equipment: Include materials, type, performance, characteristics, voltage, phase, capacity, and similar data. Provide wiring diagrams when applicable. Submittals indicating catalogue, model, and serial numbers representing specified equipment will be assumed to comply with the Contract Documents in all respects.

C. Where contents of submitted literature from manufacturers includes data not pertinent to the submittal, clearly show which portions of the contents is being submitted for review.

2.03 SAMPLES

A. Provide physical Sample or Samples identical to the precise article proposed to be provided.
   1. Identify as described under "Identification of submittals" below.

B. Number of Samples required:
   1. Unless otherwise specified, submit six (6) physical Samples, which includes one (1) to be retained by the Architect and two (2) to be retained by the Owner.
2. By prearrangement in specific cases, a single Sample may be submitted for review and, when approved, be installed in the Work at a location agreed upon by the Architect.

2.04 COLORS AND PATTERNS

A. Unless the precise color and pattern is specifically called out in the Contract Documents, and whenever a choice of color or pattern is available in the specified products, submit accurate, physical color and pattern charts to the Architect for selection.

2.05 EQUIPMENT OPERATING AND MAINTENANCE DATA

A. Provide Operating, Maintenance and Product data manuals as described in Section 01 78 23 of these Specifications.

2.06 UTILITY APPROVALS

A. Approval of utilities or other public authorities having jurisdiction shall be obtained and reflected on all affected submittals.

2.07 DEVIATIONS FROM CONTRACT DOCUMENTS

A. Clearly mark all deviations in a conspicuous manner indicating component and system variations, additions and deletions, revised equipment locations, construction detail variations, substitutions, and similar changes or deviations. Indicate headroom heights, ceiling heights, clearances, and other dimensions affected by proposed deviations. All variations from the Contract Documents not brought to the attention of the Architect shall be the sole responsibility of the Contractor even though such submittal has been accepted.

PART 3 - EXECUTION

3.01 IDENTIFICATION OF SUBMITTALS

A. Consecutively number all submittals, with reference to specification number.
   1. When material is resubmitted for any reason, transmit under a new letter of transmittal and with a new transmittal number.
   2. On resubmittals, cite the original submittal number for reference.
   3. All changes should be clearly designated as to revisions made. No consideration will be allowed for submittal revision labor made to coordinate revised, changed, adjusted details or scope of Work.

B. Accompany each submittal with a letter of transmittal showing all information required for identification and checking. Letter of transmittal should make reference to the applicable drawing numbers and specification sections to which each submittal applies.

C. On at least the first page of each submittal, and elsewhere as required for positive identification, show the submittal number in which the item was included.
D. Each submittal should indicate supplier/installer's name, phone number and the specific location(s) of the submitted product in the project.

E. Maintain an accurate submittal log for the duration of the Work, showing current status of all submittals at all times. Make the submittal log available to the Architect for his review upon request.

3.02 GROUPING OF SUBMITTALS

A. Unless otherwise specified, make submittals in groups containing all associated items to assure that information is available for checking each item when it is received.

B. Partial submittals may be rejected as not complying with the provisions of the Contract.

C. The Contractor may be held liable for delays so occasioned.

3.03 TIMING OF SUBMITTALS

A. The Contractor shall submit within fourteen (14) days of Contract award a submittal schedule listing all items and dates of submittal, and lead time for each item with particular note of priority items to be reviewed. All submittals shall be submitted in an orderly sequence.

B. A complete list of material and other required information in connection with the mechanical and electrical work of the project (plumbing, heating, ventilating, air conditioning, electrical work), as listed under the respective mechanical and electrical Specification Sections, must be submitted within thirty (30) days after the date of the Notice to Proceed; no consideration will be given to partial lists submitted from time to time.

C. Foodservice equipment submittal must be submitted within thirty (30) days after the date of the Notice to Proceed. All other submittals by the General Contractor should be made within sixty (60) days of the Notice to Proceed or far enough in advance of scheduled dates for installation to provide time required for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing delivery, whichever comes first.

D. Where it is shown that the Contractor has neglected to submit shop drawings on a timely basis or to place his orders for materials and labor early enough to conform with materials and labor requirements, color schemes, etc., such failure shall not be deemed as legitimate cause for delay.

E. In scheduling, allow at least fourteen (14) working days for review by the Architect following his receipt of the submittal. The following submittals will, by their nature, require additional time for review which should be factored into the schedule.
   1. Structural steel
   2. Metal fabrications
   3. Hollow metal, doors and finished hardware
   4. Automatic temperature controls
   5. Lighting fixtures
3.04 ARCHITECT'S REVIEW

A. Review by the Architect does not relieve the Contractor from responsibility for errors which may exist in the submitted data.

B. Revisions:
   1. Make revisions required by the Architect.
   2. If the Contractor considers any required revision to be a change, he shall so notify the Architect as provided for in the General Conditions.
   3. Make only those revisions directed or approved by the Architect.

C. Architect's approval:
   1. Until approval has been given by the Architect, any materials or items to be so approved must not be fabricated or incorporated in the Work. The Architect's approval will be only general in nature and shall not be construed as permitting any departure from Contract requirements, or as relieving the Contractor of responsibility for any errors concerning details, dimensions, materials, etc. If drawings show variations from Contract requirements because of standard shop practice or for other reasons, the Contractor shall describe such variation in his letter of transmittal. If acceptable, the Architect may approve any or all such variations, subject to proper adjustment in Contract price. If the Contractor fails to describe such variation, he shall not be relieved of the responsibility for executing the Work in accordance with the Contract, even though such drawings have been approved.
   2. Acceptance shall not be construed as a complete check but will indicate only that the general method of design, fabrication, and detailing is consistent with the design intent and that errors and discrepancies observed when reviewed have been noted. Acceptance of a separate item shall not be interpreted as an approval of an assembly in which the item functions. The right is reserved by the Architect to require submission of additional detail, shop, erection or setting drawings and of any schedules for any part of Work, whether or not specifically mentioned in the Project Specifications, where substitutions or modifications are proposed by the Contractor, or where such information is essential to the proper assembly, coordination or execution of Work under the Contract.
   3. Review and acceptance shall not relieve the Contractor from responsibility for errors in shop drawings or for proper coordination assembly of materials and equipment with other Work, nor from the responsibility of furnishing materials and labor not indicated on approved shop drawings, but required by the Contract Documents for completion of Work.

END OF SECTION 01 33 00
SECTION 01 40 00
QUALITY CONTROL

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. This Section includes administrative and procedural requirements for quality control services.

B. Quality-control services include inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by Architect.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.

D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.
   1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified inspections, tests, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with Contract Document requirements.
   3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

E. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 1 Section "Cutting and Patching" specifies requirements for repair and restoration of construction disturbed by inspection and testing activities.
   2. Division 1 Section "Submittals" specifies requirements for development of a schedule of required tests and inspections.

1.03 RESPONSIBILITIES

A. Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity, Contractor shall provide inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction. Costs for these services are included in the Contract Sum.
   1. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Contractor's responsibility, the Contractor
shall employ and pay a qualified independent testing agency to perform quality-control services. Costs for these services are included in the Contract Sum.

2. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Owner's responsibility, the Owner will employ and pay a qualified independent testing agency to perform those services. a. Where the Owner has engaged a testing agency for testing and inspecting part of the Work, and the Contractor is also required to engage an entity for the same or related element, the Contractor shall not employ the entity engaged by the Owner, unless agreed to in writing by the Owner.

B. Retesting: The Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility.
   1. The cost of retesting construction, revised or replaced by the Contractor, is the Contractor's responsibility where required tests performed on original construction indicated noncompliance with Contract Document requirements.

C. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
   1. Provide access to the Work.
   2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
   3. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
   4. Provide facilities for storage and curing of test samples.
   5. Deliver samples to testing laboratories.
   6. Provide the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
   7. Provide security and protection of samples and test equipment at the Project Site.

D. Duties of the Testing Agency: The independent agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Architect and the Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.
   1. The agency shall notify the Architect, the Owner, and the Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
   3. The agency shall not perform any duties of the Contractor.

E. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
   1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.

1.04 SUBMITTALS
A. Unless the Contractor is responsible for this service, the independent testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Architect. If the Contractor is responsible for the service, submit a certified written report, in duplicate, of each inspection, test, or similar service through the Contractor.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:
   a. Date of issue.
   b. Project title and number.
   c. Name, address, and telephone number of testing agency.
   d. Dates and locations of samples and tests or inspections.
   e. Names of individuals making the inspection or test.
   f. Designation of the Work and test method.
   g. Identification of product and Specification Section.
   h. Complete inspection or test data.
   i. Test results and an interpretation of test results.
   j. Ambient conditions at the time of sample taking and testing.
   k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
   l. Name and signature of laboratory inspector.
   m. Recommendations on retesting.

1.05 QUALITY ASSURANCE

A. Qualifications for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, that are prequalified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.

1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for Division 1 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.

C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.
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 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Installer": Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
J. "Experienced": When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

K. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.03 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

C. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

D. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

E. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

E. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG Americans with Disabilities Act (ADA)
Accessibility Guidelines for Buildings and Facilities
Available from Access Board (800) 872-2253
www.access-board.gov (202) 272-5434
A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA Aluminum Association, Inc. (The) (202) 862-5100
www.aluminum.org
AAADM American Association of Automatic Door Manufacturers (216) 241-7333
www.aaadm.com

AABC Associated Air Balance Council (202) 737-0202
www.aabchq.com

AAMA American Architectural Manufacturers Association (847) 303-5664
www.aamanet.org

AAN American Association of Nurserymen
(See ANLA)

AASHTO American Association of State Highway and (202) 624-5800
Transportation Officials
www.aashto.org

AATCC American Association of Textile Chemists and Colorists
(The) (919) 549-8141
www.aatcc.org

ABMA American Bearing Manufacturers Association (202) 367-1155
www.abma-dc.org

ACI American Concrete Institute/ACI International (248) 848-3700
www.aci-int.org

ACPA American Concrete Pipe Association (972) 506-7216
www.concrete-pipe.org

ADC Air Diffusion Council (312) 201-0101
www.flexibleduct.org

AEIC Association of Edison Illuminating Companies, Inc. (The) (205) 257-2530
www.aeic.org

AGA American Gas Association (202) 824-7000
www.apa.org

AGC Associated General Contractors of America (The) (703) 548-3118
www.agc.org

AHA American Hardboard Association (847) 934-8800
www.ahardbd.org

AHAM Association of Home Appliance Manufacturers (202) 872-5955
www.aham.org

AI Asphalt Institute (859) 288-4960
www.asphaltinstitute.org
CGA Compressed Gas Association (703) 412-0900  
www.cganet.com

CISCA Ceilings & Interior Systems Construction Association (630) 584-1919  
www.cisca.org

CISPI Cast Iron Soil Pipe Institute (423) 892-0137  
www.cispi.org

CLFMI Chain Link Fence Manufacturers Institute (301) 596-2583  
www.chainlinkinfo.org

CPA Composite Panel Association (301) 670-0604  
(Formerly: National Particleboard Association)  
www.pbmdf.com

CPPA Corrugated Polyethylene Pipe Association (800) 510-2772  
www.cppa-info.org (202) 462-9607

CRI Carpet & Rug Institute (The) (800) 882-8846  
www.carpet-rug.com (706) 278-3176

CRSI Concrete Reinforcing Steel Institute (847) 517-1200  
www.crsi.org

CSA CSA International (800) 463-6727  
(Formerly: IAS - International Approval Services) (416) 747-4000  
www.csa-international.org

CSI Construction Specifications Institute (The) (800) 689-2900  
www.csinet.org (703) 684-0300

CTI Cooling Technology Institute (281) 583-4087  
(Formerly: Cooling Tower Institute)  
www.cti.org

DHI Door and Hardware Institute (703) 222-2010  
www.dhi.org

EIA/TIA Electronic Industries Alliance/Telecommunications Industry (703) 907-7500  
Association  
www.eia.org

EIMA EIFS Industry Members Association (800) 294-3462  
www.eifsfacts.com (770) 968-7945

EJMA Expansion Joint Manufacturers Association, Inc. (914) 332-0040  
www.ejma.org

FGMA Flat Glass Marketing Association  
(See GANA)
FM Factory Mutual System
(See FMG)

FMG FM Global (401) 275-3000
(Formerly: FM - Factory Mutual System)
www.fmglobal.com

FSC Forest Stewardship Council (612) 353-4511
www.fscus.org

GA Gypsum Association (202) 289-5440
www.gypsum.org

GANA Glass Association of North America (785) 271-0208
(Formerly: FGMA - Flat Glass Marketing Association)
www.glasswebsite.com/gana

GBCI Green Building Certification Institute (800)795-1746
www.gbci.org

GRI Geosynthetic Research Institute (215) 895-2343
www.drexel.edu/gri

GTA Glass Tempering Division of Glass Association of North America
(See GANA)

HMMA Hollow Metal Manufacturers Association
(See NAAMM)

HPVA Hardwood Plywood & Veneer Association (703) 435-2900
www.hpva.org

ICEA Insulated Cable Engineers Association, Inc. (508) 394-4424
www.icea.net

ICRI International Concrete Repair Institute (The) (703) 450-0116
www.icri.org

IEEE Institute of Electrical and Electronics Engineers, Inc. (The) (212) 419-7900
www.ieee.org

IESNA Illuminating Engineering Society of North America (212) 248-5000
www.iesna.org

IGCC Insulating Glass Certification Council (315) 646-2234
www.igcc.org

IRI Industrial Risk Insurers (800) 243?8308
www.industrialrisk.com (860) 520?7300
LGSI Light Gage Structural Institute (972) 370-0967
www.loseke.com

LMA Laminating Materials Association (201) 664-2700
(Formerly: ALA - American Laminators Association)
www.lma.org

LPI Lightning Protection Institute (800) 488-6864
www.lightning.org (847) 577-7200

LSGA Laminated Safety Glass Association
(See GANA)

MBMA Metal Building Manufacturers Association (216) 241-7333
www.mbma.com

MCA Metal Construction Association (312) 201-0193
www.metalconstruction.org

MFMA Maple Flooring Manufacturers Association (847) 480-9138
www.maplefloor.org

MFMA Metal Framing Manufacturers Association (312) 644-6610

MHIA Material Handling Industry of America (800) 345-1815
www.mhia.org (704) 676-1190

MIA Marble Institute of America (614) 228-6194
www.marble-institute.com
ML/SFA Metal Lath/Steel Framing Association
(See SSMA)

MSS Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
(703) 281-6613
www.mss-hq.com

NAAMM National Association of Architectural Metal Manufacturers (312) 332-0405
www.naamm.org

NAAMM North American Association of Mirror Manufacturers
(See GANA)

NACE NACE International (281) 228-6200
(National Association of Corrosion Engineers International)
www.nace.org

NAIMA North American Insulation Manufacturers Association (703) 684-0084
(The)
www.naima.org

ACPS: JOHN ADAMS ES KITCHEN RENOVATION
Alexandria, Virginia
PE Project 72641.00.0
REFERENCES
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ACPS: JOHN ADAMS ES KITCHEN RENOVATION

Alexandria, Virginia 01 42 00 - 10
PE Project 72641.00.0 November 4, 2019

REFERENCES

NAMI National Accreditation and Management Institute, Inc. (304) 258-5100
NCMA National Concrete Masonry Association (703) 713-1900
www.ncma.org
NCPI National Clay Pipe Institute (414) 248-9094
www.ncpi.org
NEBB National Environmental Balancing Bureau (301) 977-3698
www.nebb.org
NECA National Electrical Contractors Association (301) 657-3110
www.necanet.org
NeLMA Northeastern Lumber Manufacturers' Association (207) 829-6901
www.nelma.org
NEMA National Electrical Manufacturers Association (703) 841-3200
www.nema.org
NETA InterNational Electrical Testing Association (303) 697-8441
www.netaworld.org
NFPA National Fire Protection Association (800) 344-3555
www.nfpa.org (617) 770-3000
NFRC National Fenestration Rating Council (301) 589-6372
www.nfrc.org
NGA National Glass Association (703) 442-4890
www.glass.org
NHLA National Hardwood Lumber Association (800) 933?0318
www.natlhardwood.org (901) 377-1818
NLGA National Lumber Grades Authority (604) 524-2393
www.nlga.org
NPA National Particleboard Association
(See CPA)
NRCA National Roofing Contractors Association (800) 323-9545
www.nrca.net (847) 299-9070
NRMCA National Ready Mixed Concrete Association (888) 846-7622
www.nrmca.org (301) 587-1400
NSF NSF International (800) 673-6275
(National Sanitation Foundation International) (734) 769-8010
www.nsf.org
NWWDA National Wood Window and Door Association
ACPS: JOHN ADAMS ES KITCHEN RENOVATION

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(See WDMA)
PCI Precast/Prestressed Concrete Institute (312) 786-0300
www.pci.org

PDCA Painting and Decorating Contractors of America (800) 332-7322
www.pdca.com (703) 359-0826

PDI Plumbing & Drainage Institute (800) 589-8956
www.pdionline.org (508) 230-3516

PGI PVC Geomembrane Institute (217) 333-3929
//pgi-tp.ce.uiuc.edu

RCSC Research Council on Structural Connections (800) 644-2400
www.boltcouncil.org (312) 670-2400
RFCI Resilient Floor Covering Institute
(Contact by mail only)

RMA Rubber Manufacturers Association (800) 220-7620
www.rma.org (202) 682-4800

SAE SAE International (724) 776-4841
www.sae.org

SDI Steel Deck Institute (847) 462-1930
www.sdi.org

SDI Steel Door Institute (440) 899-0010
www.steeldoor.org

SEFA Scientific Equipment and Furniture Association (843) 689-6878
www.sefalabfurn.com

SGCC Safety Glazing Certification Council (315) 646-2234
www.sgcc.org

SIGMA Sealed Insulating Glass Manufacturers Association (312) 644-6610
www.sigmaonline.org/sigma

SJI Steel Joist Institute (843) 626-1995
www.steeljoist.org

SMA Screen Manufacturers Association (561) 533-0991

SMACNA Sheet Metal and Air Conditioning Contractors' (703) 803-2980
National Association
www.smacna.org

SPI The Society of the Plastics Industry (202) 974-5200
www.plasticsindustry.org
ACPS: JOHN ADAMS ES KITCHEN RENOVATION

Alexandria, Virginia
PE Project 72641.00.0

REFERENCES
November 4, 2019
WDMA Window & Door Manufacturers Association (800) 223-2301
(Formerly: NWWDA - National Wood Window and (847) 299-5200
Door Association)
www.wdma.com

WMMPA Wood Moulding & Millwork Producers Association (800) 550-7889
www.wmmpa.com (530) 661-9591

WWPA Western Wood Products Association (503) 224-3930
www.wwpa.org

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other
Contract Documents, they shall mean the recognized name of the entities in the following list.
Names, telephone numbers, and Web site addresses are subject to change and are believed to be
accurate and up-to-date as of the date of the Contract Documents.

BOCA BOCA International, Inc. (708) 799-2300
www.bocai.org

CABO Council of American Building Officials
(See ICC)

IAPMO International Association of Plumbing and Mechanical (909) 595-8449
Officials (The)
www.iapmo.org

ICBO International Conference of Building Officials (800) 284-4406
www.icbo.org (562) 699-0541

ICC International Code Council (703) 931-4533
(Formerly: CABO - Council of American Building Officials)
www.intlcode.org

D. Federal Government Agencies: Where abbreviations and acronyms are used in
Specifications or other Contract Documents, they shall mean the recognized name of the entities
in the following list. Names, telephone numbers, and Web site addresses are subject to change
and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CPSC Consumer Product Safety Commission (800) 638-2772
www.cpsc.gov (301) 504-0990

EPA Environmental Protection Agency (202) 260-2090
www.epa.gov

FCC Federal Communications Commission (202) 418-0190
www.fcc.gov

NIST National Institute of Standards and Technology (301) 975-6478
www.nist.gov

ACPS: JOHN ADAMS ES KITCHEN RENOVATION
Alexandria, Virginia
PE Project 72641.00.0

REFERENCES
01 42 00 - 13
November 4, 2019
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION

A. Work included: Provide, at the Contractor's expense, such field engineering services as are required for proper completion of the Work including, but not necessarily limited to the following: *(PEA, interior work version)*

1. The Contractor shall be responsible for all stake outs and elevation checks required for construction. All such Work shall be performed by a professional land surveyor. The surveyor shall verify adequacy of bench marks before starting construction.

2. Before the start of any building construction, the Contractor shall have a professional land surveyor locate and stake corners and other required features of proposed work. If there are any discrepancies between the actual layout and the project site plan, they shall be brought to the attention of the Architect and resolved before Work proceeds.

3. At the end of the project, the Contractor shall have a professional land surveyor prepare an as-built survey showing the accurate locations of all building corners, configuration of paved areas and sidewalks, location of electric transformers, fencing, site walls and other major features in relation to the property lines, at the same scale as the site plan in the original contract documents.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Additional requirements for field engineering also may be described in other Sections of these Specifications.

1.03 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.04 SUBMITTALS

A. Comply with pertinent provisions of Section 01 33 00

1. Upon request of the Architect, submit:
   a. Data demonstrating qualifications of persons proposed to be engaged for field engineering services.
   b. Documentation verifying accuracy of field engineering work.
c. Certification, signed by the Contractor's retained field engineer, certifying that elevations and locations of improvements are in conformance with requirements of the Contract Documents.

1.05 PROCEDURES

A. In addition to procedures directed by the Contractor for proper performance of the Contractor's responsibilities:
   1. Locate and protect control points before starting Work on the site.
   2. Preserve permanent reference points during process of the Work.
   3. Do not change or relocate reference points or items of the Work without specific approval from the Architect.

B. Promptly advise the Architect when a reference point is lost or destroyed, or requires relocation because of other changes in the Work.
   1. Upon direction of the Architect, require the field engineer to replace reference stakes or markers.
   2. Locate such replacements according to the original survey control.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 45 00
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION

A. Work included: Provide temporary facilities and controls needed for the Work including, but not necessarily limited to:

1. Temporary utilities such as heat, water, electricity, and telephone.
2. Temporary enclosure and fencing.
3. Temporary signage; layout of temporary project identification sign follows this section.

B. Related Work:

1. Except that equipment furnished by subcontractors shall comply with requirements of pertinent safety regulations, such equipment normally furnished by the individual trades in execution of their own portions of the Work are not part of this Section.
2. Permanent installation and hookup of the various utility lines are described in other Sections.
3. Comply with Division 1 Section “Indoor Air Quality Requirements.”

PART 2 - PRODUCTS

2.01 UTILITIES

A. Cold weather protection and temporary heat:

1. The Contractor shall provide at his own expense all cold weather protection, temporary heat and fuel, and powered ventilation as necessary to carry on the Work during inclement weather, to protect all Work and materials against injury from dampness and cold, to dry out the building and to provide suitable conditions for the installation and curing of materials until final acceptance. Equipment for heating shall be U.L. approved and shall have automatic temperature controls.
2. Refer to requirements in other sections of specifications for temperatures to be provided and maintained for installation and curing under the various trades. The method of heating and the type of fuel and equipment used shall be subject to approval by the Architect. Open flame type heaters will not be permitted after the building is enclosed. The permanent heating system for the building shall be used to provide temporary heating as hereinafter specified.
3. The heating requirements during construction are divided into "Cold Weather Protection" and "Temporary Heat" as hereinafter specified.

B. Cold Weather Protection:

1. Cold Weather Protection shall be required from the start of the Project up to the time when the Work is entirely closed in and the heating apparatus is in permanent position, ready for operation on a temporary basis, by the Contractor. This Work shall include protection of Work exposed to the elements against adverse dampness and cold, by covering, enclosing, and heating materials and Work under construction, and providing suitable working conditions for all trades employed on the Work. This cold weather protection shall be provided by the Contractor at his own expense.

C. Temporary heat:

1. Temporary heat shall include the period when heating is required from the time the Work is entirely closed in and the heating apparatus is in permanent position and ready for operation, until the building and equipment is accepted by the Owner.
2. Temporary heating shall be provided from the permanent heating system when necessary to prevent freezing within the building, to dry out the building and to provide suitable working conditions for the installation and curing of materials. A temperature of not less than 50 degrees F. nor more than the maximum design temperatures shall be maintained throughout the entire building. Heat during non-working hours shall be provided when required by the status of the Work.
3. The Contract Price shall include the cost of all necessary labor and operating personnel required to operate the heating system and provide temporary heat. The cost of fuel and electric power for operating the system shall be borne by the Contractor.

D. Use of permanent heating equipment:

1. The installation of permanent heating equipment shall be done as soon as possible. If permanent electrical service is not yet available, the Contractor shall install temporary service of the proper characteristics for the operation of the heating plant. Temporary connections, controls and other arrangements shall be installed to permit the most effective use of the heating system, or parts thereof. The Contractor shall be responsible for the use of the permanent heating system for the purposes described and shall pay all costs in connection therewith. Such use shall not relieve the Contractor of his responsibility to turn over the system to Owner in perfect condition on completion of the project, nor shall it shorten the stipulated guarantee period.

E. Water:

1. Temporary water
   a. The Contractor shall make the necessary arrangements to provide all water required during the entire construction period. The Contractor shall have the new water service set up in their name. All water bills for the project shall be paid by the Contractor for the period from the beginning of the
Work until the building is occupied by the Owner. When the date is established that the Owner assumes responsibility for the account, the meter will be read and account transferred to the Owner. Any costs for reading or transferring the account shall be borne by the Contractor.

F. Temporary electric service:

1. Temporary electric service
   a. The Contractor shall make the necessary arrangements and provide all temporary electric service and lighting required during the entire construction period. The account will be set up in the Contractor's name. The metered cost of electricity used shall be borne by the Contractor.

G. Temporary Telephone:

1. At his own expense, the Contractor shall install and maintain a job telephone to which the Owner and Architect and their representatives may have free use and access during working hours while making calls in regard to this project. Calls, including long distance calls within the Washington metropolitan area, shall be at the expense of the Contractor. At all times, the Contractor shall maintain a separate dedicated line with a facsimile machine.

2.02 FIELD OFFICES AND SHEDS

A. Field Offices - Owner will provide Contractor with space within the building for a field office. Contractor shall maintain a suitable temporary field office at the project site for his own use and the use of representatives of the Owner and Architect. The office shall be provided with adequate heat, air conditioning for progress meetings, a ventilating fan, electric lighting, telephone, file rack for storage of drawings, countertop for drawing references, storage shelves, a table, and seating for a minimum of 10 persons, in addition to furnishings required by the Contractor for his own use.

B. Sheds - Contractor shall provide and maintain such additional offices, storage sheds and other temporary buildings or trailers on the project site as required for his own use. Subcontractors shall provide their own temporary sheds or trailers. Locations of sheds and trailers shall be approved by the Owner and Architect. Where possible vacated existing building space may be considered for these needs.

2.03 SANITARY FACILITIES

A. Temporary Toilets

1. The Contractor shall provide and maintain an adequate number of approved prefabricated temporary toilets with proper enclosures as necessary for use of workmen. Keep toilets clean and comply with all applicable health and sanitary regulations.

2. When ready, Contractor shall designate certain new toilet facilities in the building to be used by workmen. Contractor shall be responsible for seeing that such use does not interfere with construction and shall keep facilities in a clean and sanitary condition.
2.04 ENCLOSURES

A. Provide and maintain for the duration of construction all scaffolds, tarpaulins, canopies, warning signs, steps, platforms, bridges, and other temporary construction necessary for proper completion of the Work in compliance with pertinent safety and other regulations.

2.05 TEMPORARY FENCING

A. Provide and maintain for the duration of construction a temporary fence of design and type needed to prevent entry onto the Work site by unauthorized persons.

2.06 TEMPORARY SIGNS

A. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes indicated. Install signs where directed to inform public and persons seeking entrance to Project.

1. Engage an experienced sign painter to apply graphics for Project identification sign. Comply with design attached to this section.
2. Prepare temporary signs to provide directional information to construction personnel and visitors.
3. Construct signs of exterior-type Grade B-B high-density concrete form overlay plywood in sizes and thicknesses indicated. Support on posts or framing of preservative-treated wood or steel.
4. Paint sign panel and applied graphics with exterior-grade gloss enamel over exterior primer.

B. Secure from the Architect at the Architect's office two of the Architect's standard signs. Mount at the job site where directed by the Architect. Upon completion of the Work, demount the Architect's signs and return them to the Architect's office.

C. Except as otherwise specifically approved by the Architect, do not permit other signs or advertising on the job site.

PART 3 - EXECUTION

3.01 MAINTENANCE AND REMOVAL

A. Maintain temporary facilities and controls as long as needed for safe and proper completion of the Work.

B. Remove such temporary facilities and controls as rapidly as progress of the Work will permit, or as directed by the Architect.

END OF SECTION 01 50 00
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. This Section includes administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 1 Section "Reference Standards and Definitions" specifies the applicability of industry standards to products specified.
   2. Division 1 Section "CPM Schedules & Reports" specifies requirements for submittal of the Contractor's Construction Schedule and the Submittal Schedule.
   3. Division 1 Section "Substitutions" specifies administrative procedures for handling requests for substitutions made after award of the Contract.

1.03 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.

B. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   a. "Named Products" are items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
   b. "Foreign Products," as distinguished from "domestic products," are items substantially manufactured (50 percent or more of value) outside the United States and its possessions. Products produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens of, nor living within, the United States and its possessions are also considered to be foreign products.

C. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
D. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

1.04 SUBMITTALS

A. Product List: Prepare a list showing products specified in tabular form acceptable to the Architect. Include generic names of products required. Include the manufacturer's name and proprietary product names for each item listed.
   1. Coordinate product list with the Contractor's Construction Schedule and the Schedule of Submittals.
   2. Form: Prepare product list with information on each item tabulated under the following column headings:
      a. Related Specification Section number.
      b. Generic name used in Contract Documents.
      c. Proprietary name, model number, and similar designations.
      d. Manufacturer's name and address.
      e. Supplier's name and address.
      f. Installer's name and address.
      g. Projected delivery date or time span of delivery period.
   3. Initial Submittal: Within 30 days after date of commencement of the Work, submit 3 copies of an initial product list. Provide a written explanation for omissions of data and for known variations from Contract requirements.
      a. At the Contractor's option, the initial submittal may be limited to product selections and designations that must be established early in the Contract period.
   4. Completed List: Within 60 days after date of commencement of the Work, submit 3 copies of the completed product list. Provide a written explanation for omissions of data and for known variations from Contract requirements.
   5. Architect's Action: The Architect will respond in writing to Contractor within 2 weeks of receipt of the completed product list. No response within this period constitutes no objection to listed manufactures or products but does not constitute a waiver of the requirement that products comply with Contract Documents. The Architect's response will include a list of unacceptable product selections, containing a brief explanation of reasons for this action.

1.05 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.
   1. When specified products are available only from sources that do not, or cannot, produce a quantity adequate to complete project requirements in a timely manner, consult with the Architect to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources producing products that possess these qualities, to the fullest extent possible.

B. Compatibility of Options: When the Contractor is given the option of selecting between 2 or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.
C. Foreign Product Limitations: Except under one or more of the following conditions, provide domestic products, not foreign products, for inclusion in the Work:
1. No available domestic product complies with the Contract Documents.
2. Domestic products that comply with the Contract Documents are available only at prices or terms substantially higher than foreign products that comply with the Contract Documents.

D. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior.
1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
   a. Name of product and manufacturer.
   b. Model and serial number.
   c. Capacity.
   d. Speed.
   e. Ratings.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.
1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to the site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
7. Store products subject to damage by the elements above ground, under cover in a weather tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.
PART 2 - PRODUCTS

2.01 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.
   1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
   2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures: The Contract Documents and governing regulations govern product selection. Procedures governing product selection include the following:
   1. Proprietary Specification Requirements: Where Specifications name only a single product or manufacturer, provide the product indicated. No substitutions will be permitted.
   2. Semi-proprietary Specification Requirements: Where Specifications name 2 or more products or manufacturers, provide 1 of the products indicated. No substitutions will be permitted.
      a. Where Specifications specify products or manufacturers by name, accompanied by the term "or equal" or "or approved equal," comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
   3. Nonproprietary Specifications: When Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
   4. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
   5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated.
      a. Manufacturer's recommendations may be contained in published product literature or by the manufacturer's certification of performance.
   6. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.
   7. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.
      a. Where no product available within the specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category.
8. Visual Selection: Where specified product requirements include the phrase "... as selected from manufacturer's standard colors, patterns, textures ..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern, and texture from the product line selected.

9. Allowances: Refer to individual Specification Sections and "Allowance" provisions in Division 1 for allowances that control product selection and for procedures required for processing such selections.

PART 3 - EXECUTION

3.01 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01 60 00
SECTION 01 71 00

CLEANING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION

A. Work included: Throughout the construction period, maintain the buildings and site in a standard of cleanliness as described in this Section.

B. Related Work:
   1. In addition to standards described in this Section, comply with requirements for cleaning as described in pertinent other Sections of these Specifications.
   2. Section 01 81 19 “Indoor Air Quality Requirements”.

1.03 QUALITY ASSURANCE

A. Conduct daily inspection, and more often if necessary, to verify that requirements for cleanliness are being met.

B. In addition to the standards described in this Section, comply with pertinent requirements of governmental agencies having jurisdiction.

PART 2 - PRODUCTS

2.01 CLEANING MATERIAL AND EQUIPMENT

A. Provide required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

2.02 COMPATIBILITY

A. Use only the cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material.

PART 3 - EXECUTION

3.01 PROGRESS CLEANING

A. General
   1. Retain stored items in an orderly arrangement allowing maximum access, not impeding traffic or drainage, and providing required protection of materials.
   2. Do not allow accumulation of scrap, debris, waste materials, and other items not required for construction of this work.
3. At least twice each month, and more often if necessary, completely remove all scrap, debris, and waste materials from the job site.
4. Provide adequate storage for all items awaiting removal from the job site, observing requirements for fire protection and protection of the ecology.
5. Keep grass and other herbage cut to a maximum height of six inches (6") over the entire project site.

B. Site:

1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris, and waste materials. Remove such items to the place designated for their storage.
2. Weekly, and more often if necessary, inspect all arrangements of materials stored on the site. Restack, tidy or otherwise service arrangements to meet the requirements of subparagraph 3.1-A-1 above.
3. Maintain the site in a neat and orderly condition at all times.
   a. Structures:
   b. Weekly, and more often if necessary, inspect the structures and pick up all scrap, debris, and waste materials. Remove such items to the place designated for their storage.
   c. Weekly, and more often if necessary, sweep interior spaces clean.
   d. "Clean," for the purpose of this subparagraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and a hand-held broom.
   e. As required preparatory to installation of succeeding materials, clean the structures or pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using equipment and materials required to achieve the necessary cleanliness.
   f. Following the installation of finish floor materials, clean the finish floor daily (and more often if necessary) at all times while work is being performed in the space in which finish materials are installed.
   g. "Clean," for the purpose of this subparagraph, shall be interpreted as meaning free from foreign material which, in the opinion of the Architect, may be injurious to the finish floor material.

C. Waste Disposal:

1. Dispose of waste at legal disposal area away from the site.
2. Burning or burying of rubbish and waste materials on site and off site is not permitted.
3. Store volatile waste in accordance with applicable codes and regulations and remove from site daily. Disposal of volatile fluid wastes (such as mineral spirits, oil or paint thinner) in storm or sanitary sewer systems or into streams or waterways will not be permitted.

3.02 FINAL CLEANING

A. "Clean," for the purpose of this Article, and except as may be specifically provided otherwise, shall be interpreted as meaning the level of cleanliness generally provided by skilled cleaners using commercial quality building maintenance equipment and materials.
B. Prior to completion of the Work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final progress cleaning as described in Article 3.1 above.

C. Site:
   1. Unless otherwise specifically directed by the Architect, broom clean paved areas on the site and public paved areas adjacent to the site.
   2. Completely remove resultant debris.

D. Structures:
   1. Exterior:
      a. Visually inspect exterior surfaces and remove all traces of soil, waste materials, smudges, and other foreign matter.
         1) Remove all traces of splashed materials from adjacent surfaces.
         2) If necessary to achieve a uniform degree of cleanliness, hose down the exterior of the structure.
         3) In the event of stubborn stains not removable with water, the Architect may require light sandblasting or other cleaning at no additional cost to the Owner.
   2. Interior:
      a. Visually inspect interior surfaces and remove all traces of soil, waste materials, smudges, and other foreign matter.
      b. Remove all traces of splashed material from adjacent surfaces.
      c. Remove paint drippings, spots, stains, and dirt from finished surfaces; then, wash.
   3. Glass: Remove excess glazing compound and paint. Wash, polish, or squeegee dry to remove all visible streaks. Exterior windows should be cleaned after the completion of sodding or seeding.
   4. Ceramic Tile:
      a. Wall Tile: Remove spots, dirt, and paint; then, wash.
      b. Floor Tile: Remove spots, dirt and paint; then, machine strip and rinse with neutral cleaner.
   5. Floors: Refer to the specific flooring sections for finishes and procedures.
   6. Cabinetwork: Vacuum/dust all interior and exterior surfaces.
   7. Aluminum: Remove all temporary protective covering and clean and polish.

E. Schedule final cleaning as approved by the Architect to enable the Owner to accept a completely clean Work.

3.03 CLEANING DURING OWNER'S OCCUPANCY

A. Should the Owner occupy the Work or any portion thereof prior to its completion by the Contractor and acceptance by the Owner, responsibilities for interim and final cleaning shall be as determined by the Architect in accordance with the General Conditions of the Contract.

END OF SECTION 01 71 00
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION

A. Work included: This Section establishes general requirements pertaining to cutting, fitting and patching of the Work required to:
   1. Make the several parts fit properly;
   2. Uncover work to provide for installing, inspecting, or both, of ill-timed work;
   3. Remove and replace work not conforming to requirements of the Contract Documents; and
   4. Remove and replace defective work.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Coordinate cutting and patching with Division 1 section "Indoor Air Quality Requirements".
   3. In addition to other requirements specified, upon the Architect's request uncover work to provide for inspection by the Architect of covered work, and remove samples of installed materials for testing.
   4. Do not cut or alter work performed under separate contracts without the Architect's written permission.

1.03 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Avoid unnecessary or excessive cutting. Where cutting of a finished surface is required, make cuts neatly along true lines so they will be concealed by finished work and where they will be least conspicuous.

1.04 SUBMITTALS

A. Request for Architect's consent:
   1. Prior to cutting which effects structural safety, submit a written request to the Architect for permission to proceed with cutting. Also obtain written approval from the local building officials, if required by the local building code.
2. Should conditions of the Work, or schedule, indicate a required change of materials or methods for cutting and patching, so notify the Architect and secure his written permission and the required Change Order prior to proceeding.

B. Notices to the Architect:
1. Prior to cutting and patching performed pursuant to the Architect's instructions, submit cost estimate to the Architect. Secure the Architect's approval of cost estimates and type of reimbursement before proceeding with cutting and patching.
2. Submit written notice to the Architect designating the time the Work will be uncovered, to provide for the Architect's observation.

PART 2 - PRODUCTS

2.01 MATERIALS
A. For replacement of items removed, use materials complying with pertinent Sections of these Specifications.

2.02 PAYMENT FOR COSTS
A. The Owner will reimburse the Contractor for cutting and patching performed pursuant to the written Change Order, after claim for such reimbursement is approved by the Owner. The Contractor shall perform other cutting and patching needed to comply with the Contract Documents at no additional cost to the Owner.
B. Payment of costs for cutting and patching performed due to ill-timed or defective work will be at no additional cost to the Owner.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS
A. Inspection:
1. Inspect existing conditions, including elements subject to movement or damage during cutting, excavating, patching and backfilling.
2. After uncovering the work, inspect conditions affecting installation of new Work.
B. Discrepancies:
1. If uncovered conditions are not as anticipated, immediately notify the Architect and secure needed directions.
2. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION PRIOR TO CUTTING
A. Provide required protection including, but not necessarily limited to, shoring, bracing, and support to maintain structural integrity of the Work.

3.03 PERFORMANCE
A. The Contractor shall be responsible for any cutting, fitting and patching that may be required to complete his Work except as otherwise specifically provided in the Contract
Documents. The contractor shall not endanger any Work of any other Contractor except with the written consent of the Architect.

B. Perform fitting and adjusting of products to provide finished installation complying with the specified tolerances and finishes.

3.04 CLEANUP

A. Remove all debris, rubbish, and materials resulting from cutting and patching operations. Transport materials and legally dispose of off site.
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION

A. Work included: Compile specified warranties, bonds, and maintenance contracts and submit to the Architect. Warranties to commence no earlier than the date of Substantial Completion.

B. Related Documents:
   1. Certifications and other commitments and other agreements for continuing services to the Owner as specified elsewhere in the Contract Documents.

C. Definitions:
   1. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
   2. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.03 DESCRIPTION OF REQUIREMENTS

A. In addition to standard and special warranties described in Divisions 2 through 26, the Contractor shall warrant all work included in this project, for a minimum period of two (2) years following acceptance of a Certificate of Substantial Completion by the Owner, to cover performance, materials, workmanship and compliance with Contract Documents.

   1. Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor do they relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

B. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

C. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
D. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

E. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

F. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

1. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.04 QUALITY ASSURANCE

A. Use adequate care and diligence to thoroughly review all Contract Documents to identify detailed requirements relating to warranties and bonds.

B. Verify that each item required for this submittal conforms in all respects with the specified requirements.

1.05 SUBMITTALS

A. Assemble warranties bonds and service and maintenance contracts, executed by each respective manufacturer, supplier and contractor.

B. Submit written warranties to the Architect prior to the date established for Substantial Completion. If the Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion, or a designated portion of the Work, submit written warranties upon request of the Architect.

C. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within fifteen days of completion of that designated portion of the Work.

D. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Architect for approval prior to final execution.

E. Form of Submittals:

1. At Final Completion compile two copies of each required warranty and bond properly executed by the Contractor, subcontractor, supplier, or manufacturer.
Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

2. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11' paper.

3. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.

4. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS," the Project title or name, and the name of the Contractor.

5. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS

2.01 SCHEDULE OF WARRANTIES (PEA double check list is complete)

A. Schedule: Provide warranties and bonds on products and installations as per individual section.

1. Wood Doors Section 08 14 16 - Flush Wood Doors; Life of Installation
2. Entrance Glass Section 08 80 00 - Glazing; 5 years.
3. Mirrors Section 10 28 00 - Toilet Accessories; 5 years.

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01 74 00
PART 1 - GENERAL

1.01 SUMMARY

A. Reduce construction and demolition waste on job site and minimize waste sent to landfills through implementation of a Construction Waste Management Plan similar to LEED® Green Building Rating System™ for New Construction, Version 2.2 (LEED-NC) Materials and Resources (MR) Credit 2 and as outlined within this Section and in the Sections referenced herein.

B. Related sections: The following sections contain requirements that relate to this section:
   1. Division 01 Section “Sustainable Design Requirements”.
   2. Division 02 Sections referring to demolition.

C. Minimize the amount of non-hazardous construction waste disposal into landfills, and salvage as much non-hazardous construction waste as possible for delivery to recycling collection centers.

PART 2 - PRODUCTS

2.01 RECYCLABLE MATERIALS

A. Construction waste materials designated for recycling include, but are not limited to, the following:

   1. General waste:
      a. Paper and beverage containers used by on-site construction staff and workers.

   2. Uncontaminated packaging and shipping materials:
      a. Corrugated cardboard
      b. Metal banding/strapping
      c. Wood pallets
      d. Packing shims
      e. Paper wrappings
      f. Wood crates
      g. Polystyrene packing material.

   3. Construction metals:
      a. Light gauge framing members (cutoffs)
      b. Metal floor and roof decking (deck cutouts, etc.)
      c. Plumbing/Mechanical piping
         1) Schedule 40 black steel
         2) Copper
         3) Ductile iron
4) Cast iron
   d. Electrical conduit
   e. Concrete reinforcing steel
   f. Sheet metal (ductwork, metal flashings)
   g. Suspension wire
   h. Miscellaneous structural framing steel (angles, channels, etc.).

4. Clean unfinished wood:
   a. Dimensional lumber
   b. Wood trim
   c. Wood sheet materials such as plywood

5. Clean, unfinished gypsum board.

6. Other construction waste materials identified by Contractor that are capable of being recycled.

PART 3 - EXECUTION

3.01 WASTE MANAGEMENT PLAN IMPLEMENTATION, GENERAL

A. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all entities at the appropriate stages of the Project.

B. Facilities: Provide designated facilities for co-mingling or separation and storage of materials for recycling, salvage, reuse, return, and waste disposal, for use by all contractors and installers.

   1. Provide bi-lingual signage.
   2. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
   3. Provide adequate space, convenient to subcontractors, for pick-up and delivery. Location of space to be approved by Owner.
   4. Keep recycling and waste bin areas neat and clean to avoid contamination of materials.

C. Records: Maintain onsite logs for each load of materials removed from site:

   1. Landfill Log: Include type of material, load (by weight or volume), recycling/hauling service, date accepted by landfill, and facility fee.
   2. Waste Diversion: Include type of material, load (by weight or volume), recycling/hauling service, date accepted by recycling service, or non-profit receiver and facility fee.
   3. Where comingling occurs prior to collection, track the amount of construction waste diverted from landfill based on the weight or volume of the removed co-mingled waste and provide the documentation of percentages of recycled from the sorting facility.

D. Methods of waste disposal that are not acceptable are:
1. Burning or incinerating on or off project site.
2. Burying on project site, other than fill.
3. Dumping or burying on other property, public or private, other than official landfill.
4. Illegal dumping or burying.

E. Recycling Procedures:

1. Co-mingle or 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.
2. Coordinate work of recycling, composting and salvaging waste haulers with other trades.
3. Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

F. Reuse of materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

G. Salvage of Materials: Set aside, sort, and protect products to be salvaged for reuse offsite.

H. Hazardous Waste Handling: Separate, store and dispose of hazardous wastes separately and in accordance with local regulations. Do not handle, separate, store, salvage, or recycle hazardous materials with other materials.

END OF SECTION 01 74 19
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION

A. Work included: Provide an orderly and efficient transfer of the completed Work to the Owner.

B. Related Work:
1. Activities relative to Contract closeout are described in, but not necessarily limited to requirements stated in the General and Supplementary Conditions.

1.03 QUALITY ASSURANCE

A. Prior to requesting inspection by the Architect, use adequate means to assure that the Work is completed in accordance with the specified requirements and is ready for the requested inspection.

1.04 PROCEDURES

A. Substantial Completion:
1. Prepare and submit the list of closeout documents required by the General Conditions.
2. Within a reasonable time after receipt of the list, the Architect will inspect to determine status of completion.
3. Should the Architect determine that the Work is not substantially complete:
   a. The Architect promptly will so notify in writing the Contractor giving the reasons therefore.
   b. The Contractor shall remedy the deficiencies within seven (7) days and notify the Architect for reinspection.
   c. The Architect will reinspect the Work.
4. When the Architect concurs that the Work is substantially complete:
   a. The Architect will prepare a "Certificate of Substantial Completion," on AIA form G704, accompanied by the Contractor's list of items to be completed or corrected, as verified by the Architect.
   b. The Architect will submit the Certificate to the Owner and to the Contractor for their written acceptance of the responsibilities assigned to them in the Certificate.
   1) Prior to the issuance of a Certificate of Substantial Completion, the following actions must be performed:
   2) Resolution of all of the Contractor's Punch List items to the satisfaction of the Owner and Architect.
   3) Inspection of fire suppression systems by the State Fire Marshall's office and Insurance Rating Bureau, including correction of any cited deficiencies.
4) Fully operate, test and adjust all heating, ventilating and air conditioning (HVAC) systems and components, including air balance and noise level testing, and correct all deficiencies, anomalies and deviations from the Contract Documents and manufacturers' recommendations.

5) Fully operate, test and adjust all electrical systems as necessary to comply with applicable codes and the requirements of the electric service utility.

6) Provide on-site demonstrations, and operating and maintenance instructions to the Owner's personnel for all mechanical and electrical systems. Make operating and maintenance manuals available at this time.

7) Notify applicable utility companies to terminate temporary services.

8) Secure occupancy permits from permitting authorities.

9) Obtain applicable Health Department inspections and permits.

10) Deliver all warranties to the Owner.

11) Remove all debris and trash from the project site.

B. Final Completion:
1. Prepare and submit the notices required by the General Conditions.
2. Verify that the Work is complete including, the items referenced in the General Conditions.
3. Certify that:
   a. Contract Documents have been reviewed;
   b. Work has been inspected for compliance with the Contract Documents;
   c. Work has been completed in accordance with the Contract Documents;
   d. Equipment and systems have been tested as required, and are operational;
   e. Work is completed and ready for final inspection.

C. The Architect will make an inspection to verify status of completion.

D. Should the Architect determine that the Work is incomplete or defective:
1. The Architect promptly will so notify the Contractor, in writing, listing the incomplete or defective work.
2. The Contractor shall remedy the deficiencies within seven (7) days and notify the Architect when ready for reinspection.
3. When the Architect determines that the Work is acceptable under the Contract Documents, he will request the Contractor to make closeout submittals.
4. Closeout submittals include, but are not necessarily limited to:
   a. Project Record Documents
   b. Operation and maintenance data for items so listed in pertinent other Sections of these Specifications, and for other items when so directed by the Architect;
   c. Warranties and bonds;
   d. Keys and keying schedule;
   e. Spare parts and materials extra stock;
   f. Evidence of compliance with requirements of governmental agencies having jurisdiction including, but not necessarily limited to:
      g. Certificates of Inspection;
      h. Certificates of Occupancy;
      i. Certificates of Insurance for products and completed operations.
      j. Evidence of payment and release of liens, in duplicate;
k. List of subcontractors, service organizations, and principal vendors, including names, addresses, and telephone numbers where they can be reached for emergency service at all times including nights, weekends, and holidays.

5. Final adjustment of accounts:
   a. Submit a final statement of accounting to the Architect, showing all adjustments to the Contract Sum.
   b. If so required, the Architect will prepare a final Change Order showing adjustments to the Contract Sum which were not made previously by Change Orders.

1.05 INSTRUCTION

A. Instruct the Owner's personnel in proper operation and maintenance of systems, equipment, and similar items which were provided as part of the Work.

1.06 END OF WARRANTY INSPECTION

A. The Contractor shall arrange to meet with the Architect and Owner within 30 days prior to the specified end of the guarantee period for the purpose of assimilating a list of items which require correction under specific guarantees.

B. Should the Contractor be unable or fail to schedule such a meeting, all guarantees shall be automatically extended until such time as the meeting takes place and the Contractor shall be fully responsible for correcting such deficiencies as if they occurred under the original guarantee period.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 77 00
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION

A. Work included: To aid the continued instruction of operation and maintenance personnel, and to provide a positive source of information regarding the products incorporated into the Work, furnish and deliver the data described in this Section and in pertinent other Sections of these Specifications.

B. Related Work:
   1. Documents affecting work of this Section include, but not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Required contents of submittals also may be amplified in pertinent other Sections of these Specifications.

1.03 QUALITY ASSURANCE

A. In preparing data required by this Section, use only personnel who are thoroughly trained and experienced in operation and maintenance of the described items, completely familiar with the requirements of this Section, and skilled in technical writing to the extent needed for communicating the essential data.

1.04 SUBMITTALS

A. Comply with pertinent provisions of Section 01 33 00 - Submittals.

B. Submit one copy of completed data in final form at time of Substantial Completion inspection. Copy will be returned after final inspection or acceptance, with comments.

C. Submit specified number of copies of approved data in final form ten (10) days before Final Application for Payment.

PART 2 - PRODUCTS

2.01 INSTRUCTION MANUALS

A. Where instruction Manuals are required to be submitted under other Sections of these Specifications, prepare in accordance with the provisions of this Section.

B. Format:
   1. Size: 8-1/2 inch by 11 inch
2. Paper: White bond, at least 20 lb weight
3. Text: Neatly written or printed at maximum 12 cpi.
4. Drawings: 11" in height preferable; bind in with text; foldout acceptable but fold to fit within the Manual and provide a drawing pocket inside rear cover or bind in with text.
5. Flysheets: Separate each portion of the Manual with neatly prepared flysheets briefly describing contents of the ensuing portion; flysheets may be in color.
6. Binding: Use commercial quality 3-ring binders with durable and cleanable plastic covers. The maximum ring size will be 2 inches. When multiple binders are used, correlate the data into related consistent groupings.
7. Measurements: Provide all measurements in U.S. standard units such as feet and inches, lbs, and cfm; where items may be expected to be measured within ten years in accordance with metric formulae, provide additional measurements in the "International System of Units" (SI).

C. Provide front and back covers for each Manual, using durable material approved by the Architect, and clearly identified on or through the cover with at least the following information:

OPERATING AND MAINTENANCE INSTRUCTIONS

( )
(name and address of Work)

( )
(name of Contractor)

( )
(general name of this Manual)

( )
(space for approval signature of the Architect and approval data)

D. Contents: Include at least the following:
1. Neatly typewritten index near the front of the Manual, giving immediate information as to location within the Manual of all emergency information regarding the installation.
2. List of all Contractors, Subcontractors and suppliers with complete name of firm, subsidiary, etc.; address, telephone number, and principal contact person.
3. Complete instructions regarding operation and maintenance of all mechanical and electrical systems equipment involved including lubrication, disassembly, and reassembly.
4. Complete nomenclature of all mechanical and electrical system parts and equipment.
5. Complete nomenclature and part number of all replaceable parts, name and address of nearest vendor, and all other data pertinent to procurement procedures.
6. Complete operating, maintenance, cleaning and product data for every finish material and product contained in the finished project, including, but not limited to the following:

   Architectural Woodwork
   Windows & Doors
   Finish Hardware
   Glazing
   Tile
   Resilient Flooring
Carpeting
Painting
Wall Coverings
Markerboards & Tackboards
Identifying Devices
Sealants
Lavatory Accessories
Cabinets and Storage
Window Shades

7. Copy of all guarantees and warranties issued.

E. Manufacturers' bulletins, cuts, and descriptive data, where pertinent, clearly indicating the precise items included in this installation and deleting, or otherwise clearly indicating, all manufacturers' data with which this installation is not concerned.

F. Such other data as required in pertinent Sections of these Specifications.

PART 3 - EXECUTION

3.01 INSTRUCTION MANUALS

A. Preliminary:
   1. Prepare a preliminary draft of each proposed Manual.
   2. Show general arrangement, nature of contents in each portion, probable number of drawings and their size, and proposed method of binding and covering.
   3. Secure the Architects approval prior to proceeding
      a. Final: Complete the Manuals in strict accordance with the approved preliminary drafts and the Architect's review comments.
   4. Revisions:
      a. Following the indoctrination and instruction of operation and maintenance personnel, review all proposed revisions of the Manual with the Architect.
      b. If the Contractor is required by the Architect to revise previously approved Manuals, compensation will be made as provided for under "Changes" in the General Conditions.

END OF SECTION 01 78 23
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION

A. Work included:
1. Throughout the progress of the Work, maintain an accurate record of changes in the Contract Documents, as described in Article 3.1 below.
2. Upon completion of the Work, transfer the recorded changes to a set of Record Documents, as described in Article 3.2 below.

B. Related Work:
1. Other requirements affecting Project Record Documents may appear in pertinent other Sections of these Specifications.

1.03 QUALITY ASSURANCE

A. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff as approved by the Architect.

B. Accuracy of records:
1. Thoroughly coordinate changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other Documents where such entry is required to show the change properly.
2. Accuracy of records shall be such that future search for items shown in the Contract Documents may rely reasonably on information obtained from the approved Project Record Documents.
3. Make entries within 72 hours after receipt of information that the change has occurred.

1.04 SUBMITTALS

A. Comply with pertinent provisions of Section 01 33 00

B. The Architect's approval of the current status of Project Record Documents may be a prerequisite to the Architect's approval of requests for progress payment and request for final payment under the Contract.

C. Prior to submitting each request for progress payment, secure the Architect's approval of the current status of the Project Record Documents.
1. Prior to submitting request for final payment, submit the final Project Record Documents to the Architect and secure his approval.
1.05 PRODUCT HANDLING

A. Maintain the job set of Record Documents completely protected from deterioration and from loss and damage until completion of the Work and transfer of all recorded data to the final Project Record Documents.

B. In the event of loss of recorded data, use means necessary to again secure the data to the Architect's approval.
   1. Such means shall include, if necessary in the opinion of the Architect, removal and replacement of concealing materials.
   2. In such case, provide replacements to the standards originally required by the Contract Documents.

PART 2 - PRODUCTS

2.01 RECORD DOCUMENTS

A. Job set: Promptly following receipt of the Owner's Notice to Proceed, secure from the Architect at no charge to the Contractor one complete set of all Documents comprising the Contract.

B. Final Record Documents: At a time nearing completion of the Work, secure from the Architect at no charge to the Contractor one complete set of sepia transparencies of all Drawings in the Contract.

PART 3 - EXECUTION

3.01 MAINTENANCE OF JOB SET

A. Immediately upon receipt of the job set described in Paragraph 2.1-A above, identify each of the Documents with the title, "RECORD DOCUMENTS - JOB SET."

B. Preservation:
   1. Considering the Contract completion time, the probable number of occasions upon which the job set must be taken out for new entries and for examination, and the conditions under which these activities will be performed, devise a suitable method for protecting the job set to the approval of the Architect.
   2. Do not use the job set for any purpose except entry of new data and for review by the Architect, until start of transfer of data to final Project Record Documents.
      a. Maintain the job set at the site of Work as that site is designated by the Architect.

C. Making entries on Drawings
   1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe the change by graphic line and note as required.
   2. Date all entries.
   3. Call attention to the entry by a "cloud" drawn around the area or areas affected.
      a. In the event of overlapping changes, use different colors for the overlapping changes.

D. Make entries in the pertinent other Documents as approved by the Architect.

E. Conversion of schematic layouts:
1. In some cases on the Drawings, arrangements of conduits, circuits, piping, ducts, and similar items, is shown schematically and is not intended to portray precise physical layout.
   a. Final physical arrangement is determined by the Contractor, subject to the Architect's approval.
   b. However, design of future modifications of the facility may require accurate information as to the final physical layout of items which are shown only schematically on the Drawings.

2. Show on the job set of Record Drawings, by dimension accurate to within one inch, the centerline of each run of items such as are described in subparagraph 3.1-E-1 above.
   a. Clearly identify the item by accurate note such as "cast iron drain," "galv. water," and the like.
   b. Show, by symbol or note, the vertical location of the item ("under slab," "in ceiling plenum," "exposed," and the like).
   c. Make all identification sufficiently descriptive that it may be related reliably to the Specifications.

3. The Architect may waive the requirements for conversion of schematic layouts where, in the Architect's judgment, conversion serves no useful purpose. However, do not rely upon waivers being issued except as specifically issued in writing by the Architect.

3.02 FINAL PROJECT RECORD DOCUMENTS

A. The purpose of the final Project Record Documents is to provide factual information regarding all aspects of the Work, both concealed and visible, to enable future modifications of the Work to proceed without lengthy and expensive site measurement, investigation, and examination.

B. Approval of recorded data prior to transfer:
   1. Following receipt of the transparencies described in Paragraph 2.1-B above, and prior to start of transfer of recorded data thereto, secure the Architect's approval of all recorded data.
   2. Make required revisions.

C. Transfer of data to Drawings:
   1. Carefully transfer change data shown on the job set of Record Drawings to the corresponding transparencies, coordinating the changes as required.
   2. Clearly indicate at each affected detail and other Drawing a full description of changes made during construction, and the actual location of items described in subparagraph 3.1-E-1 above.
   3. Call attention to each entry by drawing a "cloud" around the area or areas affected.
   4. Make changes neatly, consistently, and with the proper media to assure longevity and clear reproduction.

D. Transfer of data to other Documents:
   1. If the Documents other than Drawings have been kept clean during progress of the Work, and if entries thereon have been orderly to the approval of the Architect, the job set of those Documents other than Drawings will be accepted as final Record Documents.
   2. If any such Document is not so approved by the Architect, secure a new copy of that Document from the Architect at the Architect's usual charge for reproduction and handling, and carefully transfer the change data to the new copy to the approval of the Architect.
E. Review and submittal:
1. Submit the completed set of Project Record Documents to the Architect as described in Paragraph 1.3-D above.
2. Participate in review meetings as required.
3. Make required changes and deliver the final Project Record Documents to the Architect within 30 days of substantial completion.

3.03 CHANGES SUBSEQUENT TO ACCEPTANCE

A. The Contractor has no responsibility for recording changes in the Work subsequent to Final Completion, except for changes resulting from work performed under Warranty.

END OF SECTION 01 78 39
PART 1 - GENERAL

1.01 SUMMARY

A. This project has been designed to reduce negative effects on the environment using sound ecological, social, and economic methods, while considering the health and comfort of the building’s occupants.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Division 01 Section “Construction Waste Management and Disposal”.
B. Division 01 Section “Indoor Air Quality Requirements”.
C. Division 01 Section “General Commissioning Requirements”.
D. Divisions 2-12 Sections for sustainable requirements specific to Work of each of those Sections.

1.03 REFERENCES

G. Carpet and Rug Institute (CRI) “Green Label” IAQ Testing Program for Carpet Cushion.


L. Forest Stewardship Council (FSC) Guidelines.

M. Green Seal (GC) Standard GC-03 “Anti-Corrosive Paints.”

N. Green Seal (GS) Standard GS-11 “Paints.”


P. Green Seal (GS) Standard GS-37 “Industrial and Institutional Cleaners.”


S. Sheet Metal and Air Conditioning-General Contractors National Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, 1995

T. South Coast Air Quality Management District (SCAQMD) Rule #1113: “Architectural Coatings.”

U. South Coast Air Quality Management District (SCAQMD) Rule #1168: “Adhesive and Sealant Applications.”

V. USGBC (US Green Building Council) LEED NC Green Building Rating System:

1.04 DEFINITIONS

A. CONSTRUCTION WASTE: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition.

B. EMISSIVITY (a.k.a. infrared emittance): Indication of ability of a material to shed infrared radiation.

C. LEED: Stands for Leadership in Energy and Environmental Design, a voluntary green building rating system created and managed by the US Green Building Council (USGBC).

D. NON-TOXIC: Neither immediately poisonous to humans, nor poisonous after a long period of exposure.

E. POST-CONSUMER RECYCLED CONTENT: Waste material generated by households or by commercial industrial and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose. Recycled content shall be defined in accordance with ISO Standard 14021.
F. POTABLE WATER: Water suitable for drinking and supplied from wells or municipal water systems.

G. PRE-CONSUMER RECYCLED CONTENT: Material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind and scrap generated in a process and capable of being reclaimed within the same process that generated it. Recycled content shall be defined in accordance with ISO Standard 14021.

H. RECYCLING: Collection, reprocessing, marketing and use of materials that were recovered or diverted from solid waste stream.

I. REGIONALLY EXTRACTED, HARVESTED, OR RECOVERED: Refers to location where material was extracted, harvested or recovered. For products containing multiple materials, each material must be calculated separately.

J. REGIONALLY MANUFACTURED: Refers to location of final assembly of components into the building product furnished and installed by tradespeople.

K. SALVAGE: Removal of existing materials or assemblies for re-installation or other use as directed by Owner.

L. SEDIMENT: Soil and other debris that has been eroded and transported by storm or production run-off water.

M. SOLAR REFLECTANCE INDEX: Measure of a material’s ability to reject solar heat, as shown by a small temperature rise. It is calculated according to ASTM E1980 using material’s Emittance and Reflectivity values. Standard black has an SRI of 0 and standard white has an SRI of 100.

N. SUSTAINABLE DESIGN: Design which reduces negative effects on the environment using sound ecological, social, and economic methods, while considering the health and comfort of a building’s occupants.

O. TOXIC: Poisonous to humans, either immediately, or after a long period of exposure.

P. VENTILATION: The process of supplying and removing air to and from interior spaces by natural or mechanical means.

Q. VOLATILE ORGANIC COMPOUNDS (VOC): Carbon compounds that participate in atmospheric photochemical reactions, (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates, and ammonium carbonate). The compounds vaporize (become a gas) at normal room temperatures.

R. WASTE: Extra material or material that has reached end of its useful life in its intended use.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)
PART 1 - GENERAL

1.01 SUMMARY

A. Implement the following procedures in an effort to improve indoor air quality during construction and Owner’s occupancy.

B. Related sections: The following sections contain requirements that relate to this section:
   1. Division 01 Section “Sustainable Design Requirements”.

1.02 REFERENCES

A. See Division 01 Section “Sustainable Design Requirements” for standards referenced herein.

1.03 PRODUCT DATA SUBMITTALS

A. Manufacturer product data indicating MERV rating of temporary and permanent filtration media.

B. Manufacturer product data indicating chemical content and Green Seal certification of cleaning products.

C. Low-Emitting Materials: For each low-emitting product submitted, provide the following product data:

   1. Adhesives, sealants, paints and coatings: VOC content as measured in grams per Liter (g/L).
   4. Composite wood and agrifiber products: Manufacturer declaration that product contains no added urea-formaldehyde.
   5. Laminating Glues: Manufacturer declaration that product contains no added ureaformaldehyde.

1.04 PROJECT MEETINGS

A. Construction indoor air quality management shall be discussed.

PART 2 - PRODUCTS

2.01 LOW-EMITTING MATERIALS

A. Adhesives applied within the building waterproofing envelope shall comply with VOC Content limits, as expressed in grams per liter, less water and exempt compounds, of
South Coast Air Quality Management District (SCAQMD) Rule 1168 “Adhesive and Sealant Applications,” amended January 7, 2005, or more stringent levels, as follows:

1. Indoor Carpet & Pad Adhesives: 50
2. Rubber Floor Adhesives: 60
3. Subfloor Adhesives: 50
4. Ceramic Tile Adhesives: 65
5. Dry Wall and Panel Adhesives: 50
6. Cove Base Adhesives: 50
7. Multipurpose Construction Adhesives: 70
8. PVC Welding: 510
9. CPVC Welding: 490
10. ABS Welding: 325
12. Adhesive Primer for Plastic: 550
13. Contact Adhesive: 80
14. Special Purpose Contact Adhesive: 250
15. Metal to metal substrates: 30
16. Plastic foam substrate: 50
17. Porous substrate except wood: 50
18. Wood substrate: 30
19. Fiberglass substrate: 80
20. All Other Welding & Installation Adhesives: 250

B. Aerosol Adhesives applied within building waterproofing envelope shall comply with the VOC Content limits, as expressed in percentage of VOCs by weight, of Green Seal (GS) Standard GS-36 “Commercial Adhesives,” October 19, 2000 as follows:

1. General Purpose Mist Spray: 65% VOCs by weight
2. General Purpose Web Spray: 55% VOCs by weight
3. Special Purpose Aerosol Adhesives (all types): 70% VOCs by weight

C. Sealants applied within building waterproofing envelope shall comply with VOC Content limits, as expressed in grams per liter, less water and exempt compounds, of SCAQMD Rule 1168 “Adhesive and Sealant Applications,” amended January 7, 2005, as follows:

1. Architectural Sealants: 250
2. Non-membrane Roof: 300
3. Single-Ply Roof Membrane: 450
4. Other: 420

D. Sealant primers applied within building waterproofing envelope shall comply with VOC Content limits, as expressed in grams per liter, less water and exempt compounds, of SCAQMD Rule 1168 “Adhesive and Sealant Applications,” amended January 7, 2005, as follows:

1. Architectural, Nonporous: 250
2. Architectural, Porous: 775
3. Other: 750

E. Paints and coatings applied within building waterproofing envelope shall comply with the following VOC Content limits as expressed in grams per liter, less water and exempt compounds, of Standard GS-11 “Paints,” First Edition, May 20, 1993; Standard
GC-03 “Anti-Corrosive Paints,” Second Edition, January 7, 1997; and SCAQMD Rule #1113 “Architectural Coatings,” January 1, 2004 as follows:

1. Flat: 50
2. Non-flat: 150
3. Anti-corrosive & anti-rust: 250
5. Clear Wood Finishes, Lacquer: 550
6. Floor Coatings: 100
7. Shellac, Clear: 730
8. Shellac, Pigmented: 550
9. Waterproofing Sealer: 250
10. Sanding Sealer: 275
11. Sealers, Other: 200
12. Stains: 250

F. Carpets shall meet testing and product requirements of the Carpet & Rug Institute Green Label Plus program.

G. Carpet cushion shall meet testing and product requirements of the Carpet & Rug Institute Green Label program.

H. Permanently installed composite wood and agrifiber products shall contain no added ureaformaldehyde.

I. Laminating adhesives used in composite wood and agrifiber product assemblies, shop applied and applied on-site, shall contain no added urea-formaldehyde.

2.02 AIR FILTRATION MEDIA

A. Filters: Filtration media rated for minimum efficiency reporting value (MERV) when tested in accordance with ASHRAE 52.2.
   1. MERV of 8, minimum.

2.03 CLEANING PRODUCTS AND EQUIPMENT

A. Green Seal qualified spot removers and cleaning agents shall be used for each given application.

B. HEPA-filter equipped vacuum cleaners shall be used for the final cleaning.

PART 3 - EXECUTION

3.01 GENERAL

A. Incorporate procedures and processes during Construction and prior to occupancy as described herein.

3.02 HVAC PROTECTION
A. If permanent HVAC is used during construction, filtration media shall be used at each return air grill. All HVAC systems, equipment and pathways shall be dust and particulate free at time of substantial completion of that phase of construction, in accordance with SMACNA “IAQ Guidelines for Occupied Buildings Under Construction.”
   1. Begin construction ventilation when building is substantially enclosed.
   2. When working in a portion of an occupied building, prevent movement of air from construction area to occupied area.

B. HVAC system shall be kept clean, free of dust, debris, moisture, gaseous and microbial contamination during storage, handling, installation and punch-out. Inspect all air inlets, air outlets, grilles, diffusers, plenums, and ducts upon completion of Work.
   1. Cover and protect (taped plastic or similar method) all exposed air inlet and outlet openings, grilles, ducts, plenums, to prevent water, moisture, dust and other contaminate intrusion.
   2. Apply protection immediately after installation of equipment and ducting.
   3. Ducting runs that require more than a single day to install shall be protected at end of each day’s Work.
   4. Leaks in return ducts and air handlers shall be checked and repaired. Do not use mechanical rooms for construction storage.
   5. Inspect filtration monthly and replace as needed with new media throughout the HVAC system. Filtration media shall be minimum MERV 8.
   6. After final phase of construction, install new filtration media throughout the HVAC system. Filtration media shall be minimum MERV 8.
   7. Cleaning of ductwork is not part of this contract; however Contractor shall bear cost of cleaning required by Owner due to failure of Contractor to protect ducts and equipment from construction pollutants as specified.

3.03 SOURCE CONTROL

A. Comply with Product specifications.

B. Provide direct exhaust to the exterior during installation of strong emitting materials, including touch-up activities. Keep exhaust away from intakes and occupied spaces.

C. Protect “absorptive” or dry sink materials from exposure to dust, debris and moisture contamination during product delivery, storage and handling from construction/demolition and punch-out activities.

D. Provide adequate ventilation of packaged dry products prior to installations. Remove from package and place in a secure, dry, well-ventilated space, free from contaminant sources and residues. Provide a temperature range of 60 degrees F minimum to 90 degree maximum continuously during ventilations period. Do not ventilate within limits of Work unless otherwise approved by Architect.

E. “Bake-out” or “super-heating” of spaces to accelerate the release of gaseous emissions is not permitted.

F. Prohibit use of fossil-fueled temporary heating units inside the building and near building entrances, windows and intakes and within 25 feet of building entrances.
G. Smoking on site is prohibited.

3.04 PATHWAY INTERUPTION

A. Provide negative pressurization of spaces under construction and/or demolition and positive pressurization of occupied or finished spaces while construction work proceeds in adjacent areas.

B. Relocate pollutant sources when project equipment or staging areas coincide with critical air flow pathways and place plastic barriers to contain construction areas.

C. Once spaces within building become occupied, work areas must remain under negative pressure. Exhaust air at a rate at least 10% greater than the rate of supply. Do not exhaust air where it can be drawn back into occupied spaces and place a continuous plastic barriers creating a seal between construction areas and occupied spaces.

3.05 HOUSEKEEPING

A. Broom clean and vacuum floors to keep dust from accumulating during construction and/or demolition. Remove debris from building on a daily basis and suppress dust during construction and/or demolition activities with wetting agents or sweeping compounds.

B. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
  1. Inspect duct intakes, return air grilles, and terminal units for dust. Clean plenum spaces, including top sides of lay-in ceilings, outside of ducts, tops of pipes and conduit, and return plenums of air handling units.
  2. Clean tops of doors and frames.
  3. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
  4. Remove intake filters last, after cleaning is complete.

C. Ensure food and food packaging is not left on the jobsite.

D. Use low-toxic pest control chemicals such as boron, if needed, unless otherwise directed.

E. Final cleaning shall be detailed and shall use a HEPA-filter vacuum throughout.

F. Remove spills or excess application of solvent-containing products as soon as possible. Use low-emitting cleaning agents described under CLEANING PRODUCTS AND EQUIPMENT.

G. Keep work areas as dry as possible. Replace any absorptive (dry sink) material that is exposed to moisture.

3.06 SCHEDULING
A. Coordinate construction activities to minimize or eliminate disruption of operations in occupied portions of building.

B. Schedule for storage, installation, and protection of all components of air distribution systems.

C. Schedule for storage, installation, and protect of absorptive materials (woven, fibrous or porous in nature, such as carpet, ceiling tiles, insulation, and fabrics) from exposure to emissions during and after installation from materials and finishes with potential for short term release of off-gassing volatile organic compounds.
   1. Highlight critical methods used to protect absorptive materials from airborne pollutants such as: dust, debris, moisture, gaseous and microbial contamination.
   2. Sequence installation of absorptive materials after odor-emitting activities have occurred and have been mitigated by ventilation.

D. Do not store absorptive materials on-site if protection measures as described above cannot be ensured.

E. Avoid building occupancy while construction related pollutants are present.

F. Ensure proper and complete curing of concrete before covering.

3.07 INDOOR AIR QUALITY MANAGEMENT, PRIOR TO OCCUPANCY

A. Comply with one of the following as directed by Owner:

1. Building Flushout: After construction ends and prior to occupancy with all interior finishes installed, install new filtration media. Supply a total air volume of 14,000 cu.ft. of outdoor air per sq.ft. of floor area while maintaining an internal temperature of at least 60°F and, where mechanical cooling is operated, relative humidity no higher than 60%.
   a. Space may be occupied following delivery of a minimum of 3,500 cu.ft. of outside air per sq.ft. of floor area to space, and provided the space is ventilated at minimum rate of 0.30 cfm/cu.ft. of outside air or the design minimum outside air rate, whichever is greater, a minimum of three hours prior to the occupancy and during occupancy, until the total of 14,000 cu.ft./sq.ft. of outside air has been delivered to the space.
   b. Do not start flush-out in any area until:
      1) All construction is complete.
      2) HVAC systems have been tested, adjusted, and balanced for proper operation.
      3) Inspection of inside of return air ducts and terminal units confirms that cleaning is not necessary.
      4) New HVAC filtration media have been installed.

2. Air Quality Testing: After construction ends and prior to occupancy with all interior finishes installed, use testing protocols consistent with US EPA “Compendium of Methods for the Determination of Air Pollutants in Indoor Air” and as additionally detailed in the LEED Reference Guide.
a. Owner shall provide the services of a qualified Indoor Air Quality Testing Services Firm.
b. Support the Indoor Air Quality Testing Services Firm by coordinating scheduling of required testing, and providing services during IAQ remediation if necessary.
c. Testing will be for the following contaminant concentration levels:

<table>
<thead>
<tr>
<th>Chemical Contaminant</th>
<th>Maximum Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Monoxide (CO)</td>
<td>9 parts per million and no greater than 2 ppm above outdoor levels</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>50 parts per billion</td>
</tr>
<tr>
<td>Particulates (PM10)</td>
<td>50 micrograms per cubic meter</td>
</tr>
<tr>
<td>TVOC</td>
<td>500 micrograms per cubic meter</td>
</tr>
<tr>
<td>*4-Phenylcyclohexene (4-PCH)</td>
<td>6.5 micrograms per cubic meter</td>
</tr>
</tbody>
</table>

*This test is only required if carpets and fabrics with styrene butadiene rubber (SBR) latex backing material are installed as part of the base building systems.

d. For each sampling point where maximum concentration limits are exceeded conduct flush-out with outside air and retest the specific parameter(s) that were exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting non-complying building areas, take samples from the same locations as the first test.

e. All measurements shall be conducted prior to occupancy, but during normal occupied hours and with building ventilation system starting at regular daily start time and operated at minimum outside air flow rate for occupied mode throughout duration of the air testing.

f. Building shall have all interior finishes installed. Non-fixed furnishings such as workstations and partitions are encouraged, but not required to be in place for testing.

g. For each portion of Project served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 or for each contiguous floor area, whichever is larger, and include areas with the least ventilation and greatest presumed source strength.

h. Air samples shall be collected between 3 feet and 6 feet from the floor over a minimum 4-hour period.

END OF SECTION 01 81 19
SECTION 01 91 13
GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. **Commissioning.** Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the owner’s operational needs. This is achieved through the construction phase, acceptance and the warranty period with actual verification of performance. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment start-up, control system calibration, testing and balancing, performance testing and training. Commissioning pertains to Divisions 22, 23, and 26.

Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:

1. Verify that applicable equipment and systems are installed according to the manufacturer’s recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
2. Verify and document proper performance of equipment and systems.
3. Verify that O&M documentation left on site is complete.
4. Verify that the Owner’s operating personnel are adequately trained.

B. The commissioning process does not take away from or reduce the responsibility of the installing contractors to provide a finished and fully functioning product.

C. The Owner will retain a Commissioning Authority (CA). The Contractor and all associated sub-contractors shall be responsible for participation and coordination with the Commissioning process; including:

1. Attend commissioning scoping meeting and other meetings necessary to facilitate the commissioning process.
2. Provide CA with submittals, O&M manuals and additional requested documents.
3. Assist in clarifying operation and control of equipment.
4. Perform functional performance testing under the direction of the CA.
5. Address punchlist items.
6. Correct deficiencies.

D. Abbreviations. The following are common abbreviations used in the Specifications and in the Commissioning Plan. Definitions are found in Section 1.6.

<table>
<thead>
<tr>
<th>A/E</th>
<th>Architect and Design Engineer</th>
<th>FPT</th>
<th>Functional Performance Test</th>
</tr>
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<tbody>
<tr>
<td>CA</td>
<td>Commissioning Authority</td>
<td>MC</td>
<td>Mechanical Contractor</td>
</tr>
<tr>
<td>CC</td>
<td>Controls Contractor</td>
<td>OPM</td>
<td>Owner’s Project Manager</td>
</tr>
<tr>
<td>GC</td>
<td>General Contractor</td>
<td>PFC</td>
<td>Pre-functional Checklist</td>
</tr>
</tbody>
</table>
PART 1 - GENERAL

1.01 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY
   A. This Section includes the following:
      1. Demolition and removal of selected portions of building or structure.
      2. Salvage of existing items to be reused or recycled.

1.03 DEFINITIONS
   A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
   B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.
   C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
   D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.04 SUBMITTALS
   A. Schedule of Selective Demolition Activities: Indicate detailed sequence of selective demolition and removal work, with starting and ending dates for each activity, interruption of utility services, use of elevator and stairs, and locations of temporary partitions and means of egress.
   B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
      1. Comply with submittal requirements in Division 01 Section "Construction Waste Management."

1.05 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. Predemolition Conference: Conduct conference at Project site.

1.06 PROJECT CONDITIONS

A. Hazardous Materials will be encountered in the Work as identified in the Hazardous Materials Survey Report, dated December 2, 2019. Contractor shall be responsible for abatement of hazardous materials as indicated.
   1. Copy of the Report follows this section.

B. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

C. Conditions existing at time of inspection will be maintained by Owner as far as practical.

D. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

1.07 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.

PART 2 - PRODUCTS

2.01 SALVAGED ITEMS

A. Coordinate items to be salvaged, including items to be reinstalled as part of the project. Salvaged items include but are not limited to:
   1. Furniture
   2. Appliances

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.

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. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.

G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.02 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Arrange to shut off indicated utilities with utility companies.
   2. If services/systems are required to be removed, relocated, or abandoned, 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.
   3. 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.

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.

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.

3.04 SELECTIVE DEMOLITION

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. 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.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. 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 portable fire-suppression devices during flame-cutting operations.
4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
5. Dispose of demolished items and materials promptly. Comply with requirements in Division 01 Section "Construction Waste Management and Disposal."

B. 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 on-site.
5. Protect items from damage during transport and storage.

C. 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.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.05 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, 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. 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.
LIMITED ASBESTOS-CONTAINING MATERIALS SURVEY

JOHN ADAMS ELEMENTARY SCHOOL KITCHEN RENOVATION PROJECT

5651 RAYBURN AVENUE
ALEXANDRIA, VIRGINIA 22311

ECS PROJECT NO. 47:1519-F4

FOR: ALEXANDRIA CITY PUBLIC SCHOOLS

DECEMBER 02, 2019
December 02, 2019

Ms. Azjargal Bartlett
Alexandria City Public Schools
1340 Braddock Place
6th Floor
Alexandria, Virginia 22314

ECS Project No. 47:1519-F4


Dear Ms. Bartlett:

ECS Mid-Atlantic, LLC (ECS) is pleased to provide Alexandria City Public Schools with the results of the above referenced Limited Asbestos-Containing Materials Survey performed at John Adams Elementary School located at 5651 Rayburn Avenue in Alexandria, Virginia. This report summarizes our observations, analytical results, findings, and recommendations related to the work performed. The work described in this report was performed by ECS in general accordance with the Scope of Services described in ECS Proposal Number 47:12590-EP and the terms and conditions of the agreement authorizing those services.

ECS appreciates this opportunity to provide Alexandria City Public Schools with our services. If we can be of further assistance to you, please do not hesitate to contact us.

Sincerely,

ECS Mid-Atlantic, LLC

Catey Bourne  
Assistant Staff Project Manager  
cbourne@ecslimited.com  
703-471-8400

Diana Krass  
Senior Project Manager  
dkrass@ecslimited.com  
703-471-8400
EXECUTIVE SUMMARY

The subject property consists of John Adams Elementary School located at 5651 Rayburn Avenue in Alexandria, Virginia. The purpose of the survey was to determine if asbestos-containing materials (ACMs) are present in the cafeteria, kitchen, and associated storage rooms, bathrooms, and hallway of the subject property which may be impacted during proposed renovations. ECS was informed that the cafeteria stage is excluded from the proposed renovation project. As requested by the client, no other materials or areas were included in this survey.

Based on the laboratory analysis of the bulk samples collected during the survey, the following materials were reported to contain asbestos:

• Black Mastic on Fiberglass Pipe Insulation Wrap;
• Black Mastic associated with 12" x 12" Beige Feathered Floor Tile;
• 12" x 12" Green-Yellow Floor Tile and associated Black Mastic; and,
• Dark Green Floor Tile (unknown size) and associated Black Mastic (Second Layer).

Recommendations regarding the removal and disposal of the ACMs identified by ECS can be found in Section 5.0 of this report.

The executive summary is an integral portion of this report, however, ECS recommends the report be read in its entirety.
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Appendix I: Drawings
Appendix II: Site Photographs
Appendix III: Asbestos Bulk Sample Results
Appendix IV: Laboratory Report(s)
Appendix V: Certifications/Licenses
1.0 SITE DESCRIPTION

The subject property consists of the John Adams Elementary School located at 5651 Rayburn Avenue in Alexandria, Virginia. Based on the information available, the building contains approximately 104,000 square feet and was reportedly constructed in 1966. This survey was limited to materials and areas in the cafeteria, kitchen, and associated storage rooms, bathrooms, and hallways that may be impacted during the proposed renovations. ECS was informed that the cafeteria stage is excluded from the proposed renovation project. As requested by the client, no other materials or areas were included in this survey.

2.0 PURPOSE

The purpose of the Limited Asbestos-Containing Materials Survey was to identify asbestos-containing materials (ACMs) which may require special handling and/or disposal if removed or disturbed during construction activities.

3.0 METHODOLOGY

ECS performed the authorized Scope of Services in general accordance with our proposal, standard industry practice(s) and methods specified by regulation(s) for the identification of Asbestos-Containing Materials (ACMs).

3.1 Asbestos-Containing Materials

The non-destructive asbestos survey was performed by an asbestos inspector who has received EPA accredited training and is licensed by the Commonwealth of Virginia. Samples of suspect ACMs were collected utilizing hand tools and placed into individual, labeled plastic bags. Unique bulk suspect ACM samples were submitted to Scientific Analytical Institute, Inc. in Greensboro, North Carolina for analysis via Polarized Light Microscopy (PLM) in accordance with current EPA-600 methodology. Materials consisting of additional layers were analyzed separately. Scientific Analytical Institute, Inc. is listed as an accredited laboratory by the National Voluntary Laboratory Accreditation Plan (NVLAP) managed by the National Institute of Standards and Technology (NIST) for bulk sample analysis by currently approved EPA methodology by PLM.

During the survey, ECS attempted to identify suspect ACMs in readily accessible areas. However, due to the destructive means required to identify some materials, certain areas were deemed inaccessible (i.e. behind walls or sub grade materials) and were not surveyed for suspect ACMs. Due to the high height of the ceiling tiles located in the cafeteria and current occupancy, ECS was not able to access these ceiling tiles in the cafeteria, or the ceiling plenums in the cafeteria and kitchen. Unidentified suspect ACMs may be located in these and/or other inaccessible areas.

Samples were collected in general accordance with EPA Standard 40 CFR 763 Subpart E, Asbestos Hazard Emergency Response Act (AHERA) and OSHA Standard 29 CFR 1926.1101 Inspection Protocol. Multiple samples of each unique material were submitted. Samples were analyzed using “Positive Stop” methodology. If one sample of a homogeneous material is reported to contain asbestos, the
remaining samples of that material are not analyzed. EPA regulations stipulate that if one sample contains asbestos the entire quantity of that material contains asbestos, regardless of additional analysis.

4.0 RESULTS

The following is a summary of laboratory results, findings and observations.

4.1 Asbestos-Containing Materials

An Asbestos-Containing Material (ACM) is defined as any material containing more than one percent (>1%) asbestos as determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763, Section 1, PLM. Materials are categorized by the U.S. EPA in the following categories:

- Friable ACMs are defined as any ACM that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure.
- Non-friable ACMs are defined as any ACM that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.
- Category I non-friable ACM are listed as following: packings, gaskets, resilient floor coverings, and asphalt roofing products containing more than one percent (>1%) asbestos.
- Category II non-friable ACM are listed as any material, excluding Category I non-friable ACM, containing more than one percent (>1%) asbestos.

Regulated Asbestos Containing Materials (RACM) are friable ACM or non-friable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading or has crumbled, been pulverized, or reduced to powder in the course of renovation and/or demolition operations.

Scientific Analytical Institute, Inc. submitted a signed final laboratory report to ECS on November 22, 2019. Eight of the bulk samples submitted for analysis were reported to contain asbestos in detectable concentrations. These materials are summarized below. In total, 57 bulk samples were submitted to the laboratory of which 78 layers were analyzed. A complete list of the sampled materials submitted for analysis and sample locations are located in the Appendix of this report. Additional details regarding the overall locations of the materials identified as asbestos-containing are provided further in the report. Photographs of collected samples reported as asbestos-containing are also located in the Appendix of this report.
Summary of Asbestos-Containing Materials Identified

<table>
<thead>
<tr>
<th>Sample Location</th>
<th>Material Description</th>
<th>Analytical Results</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Room 161A</td>
<td>Black Mastic on Fiberglass Pipe Insulation Wrap</td>
<td>5% Chrysotile</td>
<td>Category II</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-Friable</td>
<td></td>
</tr>
<tr>
<td>Hallway behind Kitchen</td>
<td>Black Mastic associated with 12&quot; x 12&quot; Beige Feathered Floor Tile</td>
<td>6% Chrysotile</td>
<td>Category I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-Friable</td>
<td></td>
</tr>
<tr>
<td>Storage Room 160E</td>
<td>12&quot; x 12&quot; Green-Yellow Floor Tile and associated Black Mastic</td>
<td>Tile: 4% Chrysotile Mastic: 8% Chrysotile</td>
<td>Category I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-Friable</td>
<td></td>
</tr>
<tr>
<td>Storage Room 160E and Cafeteria</td>
<td>Dark Green Floor Tile and associated Black Mastic (Unknown Size, Second Layer)</td>
<td>Tile: 3% Chrysotile Mastic: 4-6% Chrysotile</td>
<td>Category I</td>
</tr>
</tbody>
</table>

Flooring

Multiple colors of vinyl floor tile were observed throughout the surveyed areas. 12" x 12" beige feathered floor tile with asbestos-containing black mastic was observed in the hallway to the south of the kitchen. An asbestos-containing 12" x 12" green-yellow floor tile and associated asbestos-containing black mastic was observed throughout Storage Room 160E.

In the cafeteria, ECS observed green, purple, white, dark blue, light blue, and yellow vinyl floor tiles. None of these vinyl floor tiles were reported to contain asbestos; however, ECS observed an asbestos-containing dark green floor tile and associated black mastic (unknown size, second layer) underneath the above-referenced floor tiles in the cafeteria. This second layer of asbestos-containing dark green tile and associated black mastic was observed throughout the cafeteria and it was also observed at the threshold to Storage Room 160E.

Any black floor mastic observed in the cafeteria, kitchen, and associated bathrooms, storage rooms, and hallway should be considered asbestos-containing. The identified asbestos-containing floor tiles and associated mastics may be located under other flooring systems, partition walls, fixtures, cabinets, furniture, etc.

Pipe Insulation Mastic

An asbestos-containing black mastic was observed on fiberglass insulation on several pipes above the ceiling in Storage Room 161A. These pipe runs appeared to continue into the kitchen and to the adjacent Storage Room 160E and are most likely located above hard ceilings or in wall chases in other areas of the school building. ECS recommends any black mastic associated with pipe insulation be assumed asbestos-containing.
4.2 Suspect or Assumed Asbestos-Containing Materials

Due to the inaccessibility or the destructive means that asbestos sampling requires, additional suspect ACMs may remain within the building hidden behind inaccessible areas that include, but are not limited to, sub-grade walls, structural members, topping slabs, sub-grade sealants, flooring located below underlayments, areas behind exterior walls, pipe trenches, and subsurface utilities, etc. These areas were deemed inaccessible and were not assessed.

If these materials are discovered during construction activities, they should be presumed to contain asbestos and be treated as ACMs or be sampled immediately upon discovery and prior to disturbance for asbestos content by a certified asbestos inspector in accordance with 29 CFR 1926.1101.

Based upon our past experience in the identification of ACMs in similarly constructed buildings, the following additional suspect ACMs may also be located in inaccessible areas of the cafeteria, kitchen, and associated bathrooms, storage rooms, and hallway:

- **Fire Door Insulation** in doors and associated casing;
- **Thermal System Insulation** in refrigerator/freezer units;
- **Vermiculite Filler** associated with Concrete Masonry Units (CMU);
- **Thermal System Pipe Insulation/Fittings and associated Mastics** (not already identified) behind solid walls and ceilings, and/or below sub-grade;
- **Pipe Flange Gaskets** associated with heating and plumbing systems;
- **Mastics** associated with ceramic wall and floor tiles (not already identified);
- **Spray or Troweled on Fireproofing** above ceilings, along structural components, over-spray, etc.;
- **Water Fountain Components** in water fountains (pipe wrap); and,
- **Mastic/Felt Papers** associated with wood flooring, mirrors, bulletin boards, countertops, and casework.

5.0 RECOMMENDATIONS AND REGULATORY REQUIREMENTS

Based on our understanding of the purpose of the Limited Asbestos-Containing Materials Survey, the results of laboratory analysis, and our findings and observations, ECS presents the following recommendations.

5.1 Asbestos-Containing Materials

ECS recommends where a material type has been identified as asbestos containing that other materials with similar color, texture, age and size throughout the building's interior and exterior be assumed to contain asbestos. Please refer to Section 4.1 for a complete list of building materials that were reported positive for asbestos and to Section 4.2 for materials that were assumed to contain asbestos.

Asbestos-containing materials to be disturbed as part of the renovations must be properly removed by a Virginia-licensed asbestos abatement contractor prior to disturbance by construction activities. The Commonwealth of Virginia requires 20 calendar-days notice prior to the removal of friable ACM. Notification requirements in general will be dependent on the means/methods used by the contractor to abate these materials.
If ACMs are to be removed, it is recommended that an industrial hygienist monitor the project. This involves collecting air samples from within and outside abatement work areas to monitor the asbestos abatement contractor’s work practices over the course of the project. The industrial hygienist should evaluate if the asbestos abatement work is in accordance with project specifications, U.S. EPA regulation 40 CFR Part 61-National Emission Standards for Hazardous Air Pollutants Subpart M: National Emission Standard for Asbestos, and U.S. Occupational Safety and Health Administration (OSHA) regulation 29 CFR 1926.1101 – Asbestos in Construction. The industrial hygienist should assess each work area to monitor the removal of ACMs. Only after the industrial hygienist has determined the identified ACMs have been removed should final clearance air samples be collected (if necessary).

Suspect ACMs not observed due to inaccessibility or not sampled due to the destructive means that sampling would require may also be encountered during construction activities. At the time of the survey, only limited destructive means were used to locate or sample suspect ACMs; therefore, additional suspect ACMs may remain within inaccessible areas that include, but are not limited to, sub-grade walls, structural members, topping slabs, exterior areas, sub-grade sealants, flooring located below underlayments, vapor barriers, pipe trenches and other subsurface utilities, etc. If additional suspect ACMs are uncovered which were not accessible during this survey, it is recommended that these materials either be assumed to contain asbestos or be sampled prior to disturbance upon discovery for asbestos content by an asbestos inspector in accordance with 29 CFR 1926.1101.

Should any identified ACM remain in place, ECS recommends the development and implementation of a site-specific Asbestos Operations and Maintenance Plan detailing routine maintenance and repair operations, contractor notification procedures, and all other requirements under OSHA – reference 29 CFR 1926.1101.

6.0 LIMITATIONS

The conclusions and recommendations presented within this report are based upon a reasonable level of assessment within normal bounds and standards of professional practice for a site in this particular geographic setting. ECS is not responsible or liable for the discovery and elimination of hazards that may potentially cause damage, accidents, or injuries.

During this study, samples were submitted for analysis at an accredited laboratory via polarized light microscopy. As with any similar survey of this nature, actual conditions exist only at the precise locations from which samples were collected. Certain inferences are based on the results of this sampling and related testing to form a professional opinion of conditions in areas beyond those from which the samples were collected. No warranty, expressed or implied, is made.

The observations, conclusions, and recommendations pertaining to environmental conditions at the subject site are necessarily limited to conditions observed, and/or materials reviewed at the time this study was undertaken. No warranty, expressed or implied, is made with regard to the conclusions and recommendations presented within this report. This report is provided for the exclusive use of the client. This report is not intended to be used or relied upon in connection with other projects or by other unidentified third parties without the written consent of ECS and the client.
Our recommendations are in part based on federal, state, and local regulations and guidelines. ECS does not assume the responsibility of the person(s) in charge of the site, or otherwise undertake responsibility for reporting to any local, state, or federal public agencies, any conditions at the site that may present a potential danger to public health, safety, or the environment. Under this scope of services, ECS assumes no responsibility regarding any response actions initiated as a result of these findings. General compliance with regulations and response actions are the sole responsibility of the Client and should be conducted in accordance with local, state, and/or federal requirements.
Appendix I: Drawings
Appendix II: Site Photographs
1 - Asbestos-containing pipe insulation mastic in Storage Room 161A. Sample No. 1.

2 - Asbestos-containing black floor mastic associated with 12" x 12" beige feathered floor tile in the hallway behind the kitchen. Sample No. 25-B.
3 - Asbestos-containing dark green floor tile and black mastic under other floor tiles in the cafeteria. Sample Nos. 29-A and 29-B.
Appendix III: Asbestos Bulk Sample Results
# TABLE 1
## SUSPECT ASBESTOS-CONTAINING MATERIALS BULK SAMPLING RESULTS

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Sampling Location</th>
<th>Material/Description</th>
<th>Analytical Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Storage Room 161A</td>
<td>Black Mastic on Fiberglass Pipe Wrap</td>
<td>5% Chrysotile</td>
</tr>
<tr>
<td>2</td>
<td>Storage Room 161A</td>
<td>Black Mastic on Fiberglass Pipe Wrap</td>
<td>N/A</td>
</tr>
<tr>
<td>3</td>
<td>Storage Room 161A</td>
<td>Black Mastic on Fiberglass Pipe Wrap</td>
<td>N/A</td>
</tr>
<tr>
<td>4</td>
<td>Storage Room 161A</td>
<td>2’ x 4’ Drywall Ceiling Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>5</td>
<td>Storage Room 161A</td>
<td>2’ x 4’ Drywall Ceiling Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>6</td>
<td>Storage Room 161A</td>
<td>Yellow Fiberglass Pipe Wrap</td>
<td>NAD</td>
</tr>
<tr>
<td>7</td>
<td>Storage Room 161A</td>
<td>Yellow Fiberglass Pipe Wrap</td>
<td>NAD</td>
</tr>
<tr>
<td>8</td>
<td>Storage Room 161A</td>
<td>Yellow Fiberglass Pipe Wrap</td>
<td>NAD</td>
</tr>
<tr>
<td>9</td>
<td>Storage Room 161A</td>
<td>Yellow Mastic on 4” White Ceramic Wall Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>10</td>
<td>Storage Room 161A</td>
<td>Yellow Mastic on 4” White Ceramic Wall Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>11</td>
<td>Kitchen</td>
<td>White Door Caulk</td>
<td>NAD</td>
</tr>
<tr>
<td>12</td>
<td>Kitchen</td>
<td>White Door Caulk</td>
<td>NAD</td>
</tr>
<tr>
<td>13</td>
<td>Kitchen Storage Room 161D</td>
<td>Brown/Black Foil-Backed Pipe Wrap</td>
<td>NAD</td>
</tr>
<tr>
<td>14</td>
<td>Kitchen Storage Room 161D</td>
<td>Brown/Black Foil-Backed Pipe Wrap</td>
<td>NAD</td>
</tr>
<tr>
<td>15</td>
<td>Kitchen Storage Room 161D</td>
<td>Brown/Black Foil-Backed Pipe Wrap</td>
<td>NAD</td>
</tr>
<tr>
<td>16 - A</td>
<td>Kitchen</td>
<td>6” Brown Ceramic Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>16 - B</td>
<td>Kitchen</td>
<td>Gray Thinset associated with 6” Brown Ceramic Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>17 - A</td>
<td>Kitchen</td>
<td>6” Brown Ceramic Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>17 - B</td>
<td>Kitchen</td>
<td>Gray Thinset associated with 6” Brown Ceramic Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>18</td>
<td>Kitchen</td>
<td>Gray Window Caulk</td>
<td>NAD</td>
</tr>
<tr>
<td>19</td>
<td>Kitchen</td>
<td>Gray Window Caulk</td>
<td>NAD</td>
</tr>
<tr>
<td>20</td>
<td>Hallway behind Kitchen</td>
<td>2’ x 4’ Pinhole Punch Ceiling Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>21</td>
<td>Hallway behind Kitchen</td>
<td>2’ x 4’ Pinhole Punch Ceiling Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>22 - A</td>
<td>Hallway behind Kitchen</td>
<td>Plaster Ceiling Finish (above 2’ x 4’ Pinhole Punch Ceiling Tile)</td>
<td>NAD</td>
</tr>
<tr>
<td>22 - B</td>
<td>Hallway behind Kitchen</td>
<td>Plaster Ceiling Base (above 2’ x 4’ Pinhole Punch Ceiling Tile)</td>
<td>NAD</td>
</tr>
<tr>
<td>23 - A</td>
<td>Hallway behind Kitchen</td>
<td>Plaster Ceiling Finish (above 2’ x 4’ Pinhole Punch Ceiling Tile)</td>
<td>NAD</td>
</tr>
</tbody>
</table>

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### TABLE 1
**SUSPECT ASBESTOS-CONTAINING MATERIALS BULK SAMPLING RESULTS**

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Sampling Location</th>
<th>Material/Description</th>
<th>Analytical Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 - B</td>
<td>Hallway behind Kitchen</td>
<td>Plaster Ceiling Base (above 2’ x 4’ Pinhole Punch Ceiling Tile)</td>
<td>NAD</td>
</tr>
<tr>
<td>24 - A</td>
<td>Hallway behind Kitchen</td>
<td>Plaster Ceiling Finish (above 2’ x 4’ Pinhole Punch Ceiling Tile)</td>
<td>NAD</td>
</tr>
<tr>
<td>24 - B</td>
<td>Hallway behind Kitchen</td>
<td>Plaster Ceiling Base (above 2’ x 4’ Pinhole Punch Ceiling Tile)</td>
<td>NAD</td>
</tr>
<tr>
<td>25 - A</td>
<td>Hallway behind Kitchen</td>
<td>12” x 12” Beige Feathered Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>25 - B</td>
<td>Hallway behind Kitchen</td>
<td>Black Mastic associated with 12” x 12” Beige Feathered Floor Tile</td>
<td>6% Chrysotile</td>
</tr>
<tr>
<td>26 - A</td>
<td>Hallway behind Kitchen</td>
<td>12” x 12” Beige Feathered Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>26 - B</td>
<td>Hallway behind Kitchen</td>
<td>Black Mastic associated with 12” x 12” Beige Feathered Floor Tile</td>
<td>N/A</td>
</tr>
<tr>
<td>27 - A</td>
<td>Hallway behind Kitchen</td>
<td>4” Gray Cove Base</td>
<td>NAD</td>
</tr>
<tr>
<td>27 - B</td>
<td>Hallway behind Kitchen</td>
<td>White Mastic associated with 4” Gray Cove Base</td>
<td>NAD</td>
</tr>
<tr>
<td>28 - A</td>
<td>Hallway behind Kitchen</td>
<td>4” Gray Cove Base</td>
<td>NAD</td>
</tr>
<tr>
<td>28 - B</td>
<td>Hallway behind Kitchen</td>
<td>White Mastic associated with 4” Gray Cove Base</td>
<td>NAD</td>
</tr>
<tr>
<td>29 - A</td>
<td>Storage Room 160E</td>
<td>12” x 12” Green-Yellow Floor Tile</td>
<td>4% Chrysotile</td>
</tr>
<tr>
<td>29 - B</td>
<td>Storage Room 160E</td>
<td>Black Mastic associated with 12” x 12” Green-Yellow Floor Tile</td>
<td>8% Chrysotile</td>
</tr>
<tr>
<td>30 - A</td>
<td>Storage Room 160E</td>
<td>12” x 12” Green-Yellow Floor Tile</td>
<td>N/A</td>
</tr>
<tr>
<td>30 - B</td>
<td>Storage Room 160E</td>
<td>Black Mastic associated with 12” x 12” Green-Yellow Floor Tile</td>
<td>N/A</td>
</tr>
<tr>
<td>31 - A</td>
<td>Storage Room 160E</td>
<td>Plaster Ceiling Surfacing (Damaged)</td>
<td>NAD</td>
</tr>
<tr>
<td>31 - B</td>
<td>Storage Room 160E</td>
<td>Plaster Ceiling Finish (Damaged)</td>
<td>NAD</td>
</tr>
<tr>
<td>31 - C</td>
<td>Storage Room 160E</td>
<td>Plaster Ceiling Base (Damaged)</td>
<td>NAD</td>
</tr>
<tr>
<td>32 - A</td>
<td>Storage Room 160E</td>
<td>Plaster Ceiling Surfacing (Damaged)</td>
<td>NAD</td>
</tr>
<tr>
<td>32 - B</td>
<td>Storage Room 160E</td>
<td>Plaster Ceiling Finish (Damaged)</td>
<td>NAD</td>
</tr>
<tr>
<td>32 - C</td>
<td>Storage Room 160E</td>
<td>Plaster Ceiling Base (Damaged)</td>
<td>NAD</td>
</tr>
<tr>
<td>33 - A</td>
<td>Storage Room 160E</td>
<td>Plaster Ceiling Surfacing (Damaged)</td>
<td>NAD</td>
</tr>
<tr>
<td>33 - B</td>
<td>Storage Room 160E</td>
<td>Plaster Ceiling Finish (Damaged)</td>
<td>NAD</td>
</tr>
<tr>
<td>33 - C</td>
<td>Storage Room 160E</td>
<td>Plaster Ceiling Base (Damaged)</td>
<td>NAD</td>
</tr>
<tr>
<td>34 - A</td>
<td>Storage Room 160E</td>
<td>Unknown Sized Dark Green Floor Tile (Second Layer)</td>
<td>3% Chrysotile</td>
</tr>
<tr>
<td>34 - B</td>
<td>Storage Room 160E</td>
<td>Black Mastic associated with Unknown Sized Dark Green Floor Tile (Second Layer)</td>
<td>4% Chrysotile</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Sample #</th>
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<th>Material/Description</th>
<th>Analytical Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>35 - A</td>
<td>Storage Room 160E</td>
<td>Unknown Sized Dark Green Floor Tile (Second Layer)</td>
<td>N/A</td>
</tr>
<tr>
<td>35 - B</td>
<td>Storage Room 160E</td>
<td>Black Mastic associated with Unknown Sized Dark Green Floor Tile (Second Layer)</td>
<td>N/A</td>
</tr>
<tr>
<td>36</td>
<td>Cafeteria Door B</td>
<td>Beige Mastic associated with 4&quot; Blue Ceramic Wall Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>37</td>
<td>Cafeteria Door B</td>
<td>Beige Mastic associated with 4&quot; Blue Ceramic Wall Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>38 - A</td>
<td>Cafeteria Door B</td>
<td>6&quot; Black Cove Base</td>
<td>NAD</td>
</tr>
<tr>
<td>38 - B</td>
<td>Cafeteria Door B</td>
<td>White Mastic associated with 6&quot; Black Cove Base</td>
<td>NAD</td>
</tr>
<tr>
<td>39 - A</td>
<td>Cafeteria Door B</td>
<td>6&quot; Black Cove Base</td>
<td>NAD</td>
</tr>
<tr>
<td>39 - B</td>
<td>Cafeteria Door B</td>
<td>White Mastic associated with 6&quot; Black Cove Base</td>
<td>NAD</td>
</tr>
<tr>
<td>40 - A</td>
<td>Women's Bathroom 160C</td>
<td>4&quot; White Ceramic Wall Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>40 - B</td>
<td>Women's Bathroom 160C</td>
<td>Beige Mastic associated with 4&quot; White Ceramic Wall Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>41 - A</td>
<td>Women's Bathroom 160C</td>
<td>4&quot; White Ceramic Wall Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>41 - B</td>
<td>Women's Bathroom 160C</td>
<td>Beige Mastic associated with 4&quot; White Ceramic Wall Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>42</td>
<td>Women's Bathroom 160C</td>
<td>2' x 2' Pinhole with Small Fissures Ceiling Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>43</td>
<td>Women's Bathroom 160C</td>
<td>2' x 2' Pinhole with Small Fissures Ceiling Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>44</td>
<td>Cafeteria</td>
<td>12&quot; x 12&quot; Dark Blue Feathered Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>45</td>
<td>Cafeteria</td>
<td>12&quot; x 12&quot; Dark Blue Feathered Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>46</td>
<td>Cafeteria</td>
<td>12&quot; x 12&quot; Green Feathered Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>47</td>
<td>Cafeteria</td>
<td>12&quot; x 12&quot; Green Feathered Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>48</td>
<td>Cafeteria</td>
<td>12&quot; x 12&quot; Yellow Feathered Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>49 - A</td>
<td>Cafeteria</td>
<td>12&quot; x 12&quot; Yellow Feathered Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>49 - B</td>
<td>Cafeteria</td>
<td>Brown Mastic associated with 12&quot; x 12&quot; Yellow Feathered Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>50 - A</td>
<td>Cafeteria</td>
<td>12&quot; x 12&quot; White Feathered Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>50 - B</td>
<td>Cafeteria</td>
<td>Yellow Mastic associated with 12&quot; x 12&quot; White Feathered Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>51</td>
<td>Cafeteria</td>
<td>12&quot; x 12&quot; White Feathered Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>52 - A</td>
<td>Cafeteria</td>
<td>12&quot; x 12&quot; Purple Feathered Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>52 - B</td>
<td>Cafeteria</td>
<td>Brown Mastic associated with 12&quot; x 12&quot; Purple Feathered Floor Tile</td>
<td>NAD</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Sample #</th>
<th>Sampling Location</th>
<th>Material/Description</th>
<th>Analytical Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>53</td>
<td>Cafeteria</td>
<td>12” x 12” Purple Feathered Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>54 - A</td>
<td>Cafeteria</td>
<td>12” x 12” Light Blue Feathered Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>54 - B</td>
<td>Cafeteria</td>
<td>Yellow Mastic associated with 12” x 12” Light Blue Feathered Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>55 - A</td>
<td>Cafeteria</td>
<td>12” x 12” Light Blue Feathered Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>55 - B</td>
<td>Cafeteria</td>
<td>Yellow Mastic associated with 12” x 12” Light Blue Feathered Floor Tile</td>
<td>NAD</td>
</tr>
<tr>
<td>56 - A</td>
<td>Cafeteria</td>
<td>Unknown Sized Dark Green Floor Tile (Second Layer)</td>
<td>3% Chrysotile</td>
</tr>
<tr>
<td>56 - B</td>
<td>Cafeteria</td>
<td>Black Mastic associated with Unknown Sized Dark Green Floor Tile (Second Layer)</td>
<td>6% Chrysotile</td>
</tr>
<tr>
<td>57 - A</td>
<td>Cafeteria</td>
<td>Unknown Sized Dark Green Floor Tile (Second Layer)</td>
<td>N/A</td>
</tr>
<tr>
<td>57 - B</td>
<td>Cafeteria</td>
<td>Black Mastic associated with Unknown Sized Dark Green Floor Tile (Second Layer)</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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Appendix IV: Laboratory Report(s)
### Bulk Asbestos Analysis

**By Polarized Light Microscopy**


**Customer:** ECS Mid-Atlantic, LLC  
14026 Thunderbolt Place  
Suite 100  
Chantilly, VA 20151

**Project:** 47:1519-F4/ John Adams Kitchen

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Description</th>
<th>Asbestos</th>
<th>Fibrous Components</th>
<th>Non-Fibrous Components</th>
<th>Attributes</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Black Mastic on Fiberglass Pipe Wrap</td>
<td>5% Chrysotile</td>
<td>95% Other</td>
<td></td>
<td>Black Non Fibrous Homogeneous</td>
<td>Dissolved</td>
</tr>
<tr>
<td>2</td>
<td>Black Mastic on Fiberglass Pipe Wrap</td>
<td>Not Analyzed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Black Mastic on Fiberglass Pipe Wrap</td>
<td>Not Analyzed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2’ x 4’ Drywall Ceiling Tile</td>
<td>None Detected</td>
<td>10% Cellulose</td>
<td>90% Other</td>
<td>Brown, White Non Fibrous Homogeneous</td>
<td>Teased</td>
</tr>
<tr>
<td>5</td>
<td>2’ x 4’ Drywall Ceiling Tile</td>
<td>None Detected</td>
<td>10% Cellulose</td>
<td>90% Other</td>
<td>Brown, White Non Fibrous Homogeneous</td>
<td>Teased</td>
</tr>
<tr>
<td>6</td>
<td>Yellow Fiberglass Pipe Wrap</td>
<td>None Detected</td>
<td>60% Cellulose</td>
<td>40% Other</td>
<td>White, Yellow Fibrous Heterogeneous</td>
<td>Teased, Dissolved</td>
</tr>
<tr>
<td>7</td>
<td>Yellow Fiberglass Pipe Wrap</td>
<td>None Detected</td>
<td>60% Cellulose</td>
<td>40% Other</td>
<td>White, Yellow Fibrous Heterogeneous</td>
<td>Teased, Dissolved</td>
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<td>8</td>
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<td>60% Cellulose</td>
<td>40% Other</td>
<td>White, Yellow Fibrous Heterogeneous</td>
<td>Teased, Dissolved</td>
</tr>
</tbody>
</table>

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Byron Stroble (87)

---

**Approved Signatory**

Scientific Analytical Institute, Inc.  4604 Dundas Dr. Greensboro, NC 27407  (336) 292-3888
<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Description</th>
<th>Asbestos</th>
<th>Fibrous Components</th>
<th>Non-Fibrous Components</th>
<th>Attributes</th>
<th>Treatment</th>
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<tbody>
<tr>
<td>9</td>
<td>Yellow Mastic on 4&quot; White Ceramic Wall Tile</td>
<td>None Detected</td>
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<td>11</td>
<td>White Door Caulk</td>
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<td>12</td>
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<td>13</td>
<td>Foil-Backed Pipe Wrap</td>
<td>None Detected</td>
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<tr>
<td>16 - A</td>
<td>6&quot; Ceramic Floor Tile and Thin Set</td>
<td>None Detected</td>
<td>100% Other</td>
<td></td>
<td>Brown Non Fibrous Homogeneous</td>
<td>Crushed</td>
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</table>

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Byron Stroble (87)
# Bulk Asbestos Analysis

**By Polarized Light Microscopy**

**EPA Method:** 600/R-93/116 and 40 CFR, Part 763, Subpart E, App.E

---

**Customer:** ECS Mid-Atlantic, LLC  
14026 Thunderbolt Place  
Suite 100  
Chantilly, VA 20151  

**Project:** 47:1519-F4/ John Adams Kitchen  

**Atttn:** Catey Bourne  

**Lab Order ID:** 71929361  
**Analysis ID:** 71929361 PLM  
**Date Received:** 11/19/2019  
**Date Reported:** 11/22/2019

---

### Sample Details

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<th>Non-Fibrous Components</th>
<th>Attributes</th>
<th>Treatment</th>
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<td>White Non Fibrous Homogeneous</td>
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</tbody>
</table>
### Bulk Asbestos Analysis

**By Polarized Light Microscopy**

**EPA Method:** 600/R-93/116 and 40 CFR, Part 763, Subpart E, App.E

---

**Customer:** ECS Mid-Atlantic, LLC  
14026 Thunderbolt Place  
Suite 100  
Chantilly, VA 20151

**Project:** 47:1519-F4/ John Adams Kitchen

---

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Description</th>
<th>Asbestos</th>
<th>Fibrous Components</th>
<th>Non-Fibrous Components</th>
<th>Attributes</th>
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<td>Teased</td>
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<td>100% Other</td>
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<tr>
<td>25 - A</td>
<td>12” x 12” Beige Feathered Floor Tile with Black Mastic</td>
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<td>Beige</td>
<td>Non Fibrous Homogeneous</td>
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<tr>
<td>25 - B</td>
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<tr>
<td>71929361PLM_63</td>
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<tr>
<td>26 - A</td>
<td>12” x 12” Beige Feathered Floor Tile with Black Mastic</td>
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<td>Beige</td>
<td>Non Fibrous Homogeneous</td>
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<td>71929361PLM_26</td>
<td>floor tile</td>
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<td></td>
<td></td>
<td></td>
<td>Dissolved</td>
</tr>
</tbody>
</table>

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---

Byron Stroble (87)

**Approved Signatory**

Scientific Analytical Institute, Inc.  
4604 Dundas Dr. Greensboro, NC 27407  
(336) 292-3888
## Bulk Asbestos Analysis

By Polarized Light Microscopy


### Sample ID

<table>
<thead>
<tr>
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<th>Description</th>
<th>Asbestos</th>
<th>Fibrous Components</th>
<th>Non-Fibrous Components</th>
<th>Attributes</th>
<th>Treatment</th>
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<tbody>
<tr>
<td>26 - B</td>
<td>12” x 12” Beige Feathered Floor Tile with Black Mastic</td>
<td>Not Analyzed</td>
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<td>27 - A</td>
<td>4” Gray Cove Base with White Mastic</td>
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<td>100% Other</td>
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<td>Gray Non Fibrous</td>
<td>Homogeneous</td>
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<td>27 - B</td>
<td>4” Gray Cove Base with White Mastic</td>
<td>None Detected</td>
<td>100% Other</td>
<td></td>
<td>White Non Fibrous</td>
<td>Homogeneous</td>
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<tr>
<td>28 - A</td>
<td>4” Gray Cove Base with White Mastic</td>
<td>None Detected</td>
<td>100% Other</td>
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<td>Gray Non Fibrous</td>
<td>Homogeneous</td>
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<tr>
<td>28 - B</td>
<td>4” Gray Cove Base with White Mastic</td>
<td>None Detected</td>
<td>100% Other</td>
<td></td>
<td>White Non Fibrous</td>
<td>Homogeneous</td>
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<tr>
<td>29 - A</td>
<td>12” x 12” Green/Yellow Floor Tile and Brown Leveling Compound</td>
<td>4% Chrysotile</td>
<td>96% Other</td>
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<td>Green Non Fibrous</td>
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<td>29 - B</td>
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<td>Not Analyzed</td>
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<td></td>
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</tbody>
</table>

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Byron Stroble (87)

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Scientific Analytical Institute, Inc.  4604 Dundas Dr. Greensboro, NC 27407  (336) 292-3888  Page 5 of 11
## Bulk Asbestos Analysis

**By Polarized Light Microscopy**

**EPA Method:** 600/R-93/116 and 40 CFR, Part 763, Subpart E, App.E

### Customer:
ECS Mid-Atlantic, LLC  
14026 Thunderbolt Place  
Suite 100  
Chantilly, VA 20151

### Project:
47:1519-F4/ John Adams Kitchen

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<th>Attributes</th>
<th>Treatment</th>
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<tr>
<td>30 - B</td>
<td>12&quot; x 12&quot; Green/Yellow Floor Tile and Brown Leveling Compound</td>
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<tr>
<td>31 - A</td>
<td>Plaster Ceiling (Damaged)</td>
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<td>Plaster Ceiling (Damaged)</td>
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<td>Plaster Ceiling (Damaged)</td>
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<td>Plaster Ceiling (Damaged)</td>
<td>None Detected</td>
<td>100% Other</td>
<td>White</td>
<td>Non Fibrous Homogeneous</td>
<td>Teased</td>
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</table>

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## Bulk Asbestos Analysis

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<td>Mastic associated with 4&quot; Blue Ceramic Wall Tile</td>
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<td>100% Other</td>
<td>Beige</td>
<td>Non Fibrous Homogeneous</td>
<td>Dissolved</td>
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</tbody>
</table>

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---

**Customer:** ECS Mid-Atlantic, LLC  
14026 Thunderbolt Place  
Suite 100  
Chantilly, VA 20151  

**Project:** 47:1519-F4/ John Adams Kitchen  

**Attn:** Catey Bourne  

**Lab Order ID:** 71929361  
**Analysis ID:** 71929361_PLM  
**Date Received:** 11/19/2019  
**Date Reported:** 11/22/2019
# Bulk Asbestos Analysis

By Polarized Light Microscopy

**EPA Method:** 600/R-93/116 and 40 CFR, Part 763, Subpart E, App.E

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Description</th>
<th>Asbestos</th>
<th>Fibrous Components</th>
<th>Non-Fibrous Components</th>
<th>Attributes</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>38 - A</td>
<td>6&quot; Black Cove Base with White Mastic</td>
<td>None Detected</td>
<td></td>
<td>100% Other</td>
<td>Black</td>
<td>Ashed</td>
</tr>
<tr>
<td></td>
<td><strong>covebase</strong></td>
<td></td>
<td></td>
<td></td>
<td>Non Fibrous</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Homogeneous</td>
<td></td>
</tr>
<tr>
<td>38 - B</td>
<td>6&quot; Black Cove Base with White Mastic</td>
<td>None Detected</td>
<td></td>
<td>100% Other</td>
<td>White</td>
<td>Dissolved</td>
</tr>
<tr>
<td></td>
<td><strong>mastic</strong></td>
<td></td>
<td></td>
<td></td>
<td>Non Fibrous</td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Homogeneous</td>
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</tr>
<tr>
<td>39 - A</td>
<td>6&quot; Black Cove Base with White Mastic</td>
<td>None Detected</td>
<td></td>
<td>100% Other</td>
<td>Black</td>
<td>Ashed</td>
</tr>
<tr>
<td></td>
<td><strong>covebase</strong></td>
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<td></td>
<td></td>
<td>Non Fibrous</td>
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<td>Homogeneous</td>
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<td>39 - B</td>
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<td>None Detected</td>
<td></td>
<td>100% Other</td>
<td>White</td>
<td>Dissolved</td>
</tr>
<tr>
<td></td>
<td><strong>mastic</strong></td>
<td></td>
<td></td>
<td></td>
<td>Non Fibrous</td>
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</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td>Homogeneous</td>
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</tr>
<tr>
<td>40 - A</td>
<td>4&quot; White Ceramic Wall Tile and Mastic</td>
<td>None Detected</td>
<td></td>
<td>100% Other</td>
<td>White</td>
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</tr>
<tr>
<td></td>
<td><strong>ceramic tile</strong></td>
<td></td>
<td></td>
<td></td>
<td>Non Fibrous</td>
<td></td>
</tr>
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<td></td>
<td></td>
<td>Homogeneous</td>
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<tr>
<td>40 - B</td>
<td>4&quot; White Ceramic Wall Tile and Mastic</td>
<td>None Detected</td>
<td></td>
<td>100% Other</td>
<td>Beige</td>
<td>Dissolved</td>
</tr>
<tr>
<td></td>
<td><strong>mastic</strong></td>
<td></td>
<td></td>
<td></td>
<td>Non Fibrous</td>
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<td></td>
<td>Homogeneous</td>
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<tr>
<td>41 - A</td>
<td>4&quot; White Ceramic Wall Tile and Mastic</td>
<td>None Detected</td>
<td></td>
<td>100% Other</td>
<td>White</td>
<td>Crushed</td>
</tr>
<tr>
<td></td>
<td><strong>ceramic tile</strong></td>
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<td></td>
<td></td>
<td></td>
<td>Homogeneous</td>
<td></td>
</tr>
<tr>
<td>41 - B</td>
<td>4&quot; White Ceramic Wall Tile and Mastic</td>
<td>None Detected</td>
<td></td>
<td>100% Other</td>
<td>Beige</td>
<td>Dissolved</td>
</tr>
<tr>
<td></td>
<td><strong>mastic</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Homogeneous</td>
<td></td>
</tr>
</tbody>
</table>

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**Byron Stroble (87)**

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**Scientific Analytical Institute, Inc.** 4604 Dundas Dr. Greensboro, NC 27407 (336) 292-3888

---

**Page 8 of 11**
### Bulk Asbestos Analysis

**By Polarized Light Microscopy**  

**Customer:** ECS Mid-Atlantic, LLC  
14026 Thunderbolt Place  
Suite 100  
Chantilly, VA 20151

**Project:** 47:1519-F4/ John Adams Kitchen  

**Attn:** Catey Bourne  
**Lab Order ID:** 71929361  
**Analysis ID:** 71929361_PLM  
**Date Received:** 11/19/2019  
**Date Reported:** 11/22/2019

---

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Description</th>
<th>Asbestos</th>
<th>Fibrous Components</th>
<th>Non-Fibrous Components</th>
<th>Attributes</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>2' x 2' Pinhole with Small Fissures Ceiling Tile</td>
<td>None Detected</td>
<td>45% Cellulose 45% Mineral Wool</td>
<td>10% Other</td>
<td>Gray Fibrous Homogeneous</td>
<td>Teased, Ashed</td>
</tr>
<tr>
<td>43</td>
<td>2' x 2' Pinhole with Small Fissures Ceiling Tile</td>
<td>None Detected</td>
<td>45% Cellulose 45% Mineral Wool</td>
<td>10% Other</td>
<td>Gray Fibrous Homogeneous</td>
<td>Teased, Ashed</td>
</tr>
<tr>
<td>44</td>
<td>12” x 12” Dark Blue Feathered Floor Tile</td>
<td>None Detected</td>
<td>100% Other</td>
<td>Blue</td>
<td>Non Fibrous Homogeneous</td>
<td>Dissolved</td>
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<tr>
<td>45</td>
<td>12” x 12” Dark Blue Feathered Floor Tile</td>
<td>None Detected</td>
<td>100% Other</td>
<td>Blue</td>
<td>Non Fibrous Homogeneous</td>
<td>Dissolved</td>
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<tr>
<td>46</td>
<td>12” x 12” Green Feathered Floor Tile</td>
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<td>100% Other</td>
<td>Green</td>
<td>Non Fibrous Homogeneous</td>
<td>Dissolved</td>
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<td>47</td>
<td>12” x 12” Green Feathered Floor Tile</td>
<td>None Detected</td>
<td>100% Other</td>
<td>Green</td>
<td>Non Fibrous Homogeneous</td>
<td>Dissolved</td>
</tr>
<tr>
<td>48</td>
<td>12” x 12” Yellow Feathered Floor Tile</td>
<td>None Detected</td>
<td>100% Other</td>
<td>Yellow</td>
<td>Non Fibrous Homogeneous</td>
<td>Dissolved</td>
</tr>
<tr>
<td>49 - A</td>
<td>12” x 12” Yellow Feathered Floor Tile</td>
<td>None Detected</td>
<td>100% Other</td>
<td>Yellow</td>
<td>Non Fibrous Homogeneous</td>
<td>Dissolved</td>
</tr>
</tbody>
</table>

---

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---

**Byron Stroble (87)**

---

**Approved Signatory**

P-E-002 r15 1/16/2021

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4604 Dundas Dr. Greensboro, NC 27407  
(336) 292-3888  
Page 9 of 11
## Bulk Asbestos Analysis

By Polarized Light Microscopy

**EPA Method:** 600/R-93/116 and 40 CFR, Part 763, Subpart E, App.E

**Customer:** ECS Mid-Atlantic, LLC  
14026 Thunderbolt Place  
Suite 100  
Chantilly, VA 20151

**Project:** 47:1519-F4/ John Adams Kitchen

**Lab Order ID:** 71929361  
**Analysis ID:** 71929361_PLM  
**Date Received:** 11/19/2019  
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### Sample Analysis Table

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Description</th>
<th>Asbestos</th>
<th>Fibrous Components</th>
<th>Non-Fibrous Components</th>
<th>Attributes</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>49 - B</td>
<td>12&quot; x 12&quot; Yellow Feathered Floor Tile</td>
<td>None Detected</td>
<td></td>
<td>100% Other</td>
<td>Brown Non Fibrous Homogeneous</td>
<td>Dissolved</td>
</tr>
<tr>
<td></td>
<td>mastic - small sample</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 - A</td>
<td>12&quot; x 12&quot; White Feathered Floor Tile</td>
<td>None Detected</td>
<td></td>
<td>100% Other</td>
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<td>Dissolved</td>
</tr>
<tr>
<td></td>
<td>floor tile</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 - B</td>
<td>12&quot; x 12&quot; White Feathered Floor Tile</td>
<td>None Detected</td>
<td></td>
<td>100% Other</td>
<td>Yellow Non Fibrous Homogeneous</td>
<td>Dissolved</td>
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<tr>
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<td>51</td>
<td>12&quot; x 12&quot; White Feathered Floor Tile</td>
<td>None Detected</td>
<td></td>
<td>100% Other</td>
<td>Yellow Non Fibrous Homogeneous</td>
<td>Dissolved</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52 - A</td>
<td>12&quot; x 12&quot; Purple Feathered Floor Tile</td>
<td>None Detected</td>
<td></td>
<td>100% Other</td>
<td>Purple Non Fibrous Homogeneous</td>
<td>Dissolved</td>
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<td></td>
<td>floor tile</td>
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<td></td>
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</tr>
<tr>
<td>52 - B</td>
<td>12&quot; x 12&quot; Purple Feathered Floor Tile</td>
<td>None Detected</td>
<td></td>
<td>100% Other</td>
<td>Brown Non Fibrous Homogeneous</td>
<td>Dissolved</td>
</tr>
<tr>
<td></td>
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<td></td>
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<tr>
<td>53</td>
<td>12&quot; x 12&quot; Purple Feathered Floor Tile</td>
<td>None Detected</td>
<td></td>
<td>100% Other</td>
<td>Purple Non Fibrous Homogeneous</td>
<td>Dissolved</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54 - A</td>
<td>12&quot; x 12&quot; Light Blue Feathered Floor Tile</td>
<td>None Detected</td>
<td></td>
<td>100% Other</td>
<td>Blue Non Fibrous Homogeneous</td>
<td>Dissolved</td>
</tr>
</tbody>
</table>

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Byron Stroble (87)

P-E-002 v15 11/16/2021

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Scientific Analytical Institute, Inc.  4604 Dundas Dr. Greensboro, NC 27407  (336) 292-3888  Page 10 of 11
## Bulk Asbestos Analysis

### By Polarized Light Microscopy

**EPA Method:** 600/R-93/116 and 40 CFR, Part 763, Subpart E, App.E

### Customer: ECS Mid-Atlantic, LLC
14026 Thunderbolt Place
Suite 100
Chantilly, VA 20151

### Project: 47:1519-F4/ John Adams Kitchen

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Description</th>
<th>Asbestos</th>
<th>Fibrous Components</th>
<th>Non-Fibrous Components</th>
<th>Attributes</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>54 - B</td>
<td>12” x 12” Light Blue Feathered Floor Tile</td>
<td>None Detected</td>
<td>100% Other</td>
<td>Yellow Non Fibrous Homogeneous</td>
<td>Dissolved</td>
<td></td>
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<tr>
<td>55 - A</td>
<td>12” x 12” Light Blue Feathered Floor Tile</td>
<td>None Detected</td>
<td>100% Other</td>
<td>Blue Non Fibrous Homogeneous</td>
<td>Dissolved</td>
<td></td>
</tr>
<tr>
<td>55 - B</td>
<td>12” x 12” Light Blue Feathered Floor Tile</td>
<td>None Detected</td>
<td>100% Other</td>
<td>Yellow Non Fibrous Homogeneous</td>
<td>Dissolved</td>
<td></td>
</tr>
<tr>
<td>56 - A</td>
<td>Unknown Sized Dark Green Floor Tile with Black Mastic (Second Layer)</td>
<td>3% Chrysotile</td>
<td>97% Other</td>
<td>Green Non Fibrous Homogeneous</td>
<td>Dissolved</td>
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<tr>
<td>56 - B</td>
<td>Unknown Sized Dark Green Floor Tile with Black Mastic (Second Layer)</td>
<td>6% Chrysotile</td>
<td>94% Other</td>
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<td>57 - A</td>
<td>Unknown Sized Dark Green Floor Tile with Black Mastic (Second Layer)</td>
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<tr>
<td>57 - B</td>
<td>Unknown Sized Dark Green Floor Tile with Black Mastic (Second Layer)</td>
<td>Not Analyzed</td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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---

**Approved Signatory**

Scientific Analytical Institute, Inc.    4604 Dundas Dr. Greensboro, NC 27407    (336) 292-3888
### Instructions:
- Use Column "B" for your contact info.

- Enter samples between "<<" and ">>".
- Begin Samples with a "<<" above the first sample and end with a ">>" below the last sample.
- Only Enter your data on the first sheet "Sheet1".

#### Note:
- Data 1 and Data 2 are optional.
- Fields that do not show up on the official report, however, they will be included in the electronic data returned to you to facilitate your reintegration of the report data.

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### Sample Data

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<thead>
<tr>
<th>Sample Number</th>
<th>Data 1</th>
<th>Data 2</th>
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</thead>
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<tr>
<td>1</td>
<td>Black Mastic on Fiberglass Pipe Wrap</td>
<td>Storage Room 161A</td>
</tr>
<tr>
<td>2</td>
<td>Black Mastic on Fiberglass Pipe Wrap</td>
<td>Storage Room 161A</td>
</tr>
<tr>
<td>3</td>
<td>Black Mastic on Fiberglass Pipe Wrap</td>
<td>Storage Room 161A</td>
</tr>
<tr>
<td>4</td>
<td>2' x 4' Drywall Ceiling Tile</td>
<td>Storage Room 161A</td>
</tr>
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<td>5</td>
<td>2' x 4' Drywall Ceiling Tile</td>
<td>Storage Room 161A</td>
</tr>
<tr>
<td>6</td>
<td>Yellow Fiberglass Pipe Wrap</td>
<td>Storage Room 161A</td>
</tr>
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<td>7</td>
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<td>Yellow Fiberglass Pipe Wrap</td>
<td>Storage Room 161A</td>
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<td>Yellow Mastic on 4&quot; White Ceramic Wall Tile</td>
<td>Storage Room 161A</td>
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<td>Yellow Mastic on 4&quot; White Ceramic Wall Tile</td>
<td>Storage Room 161A</td>
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<tr>
<td>11</td>
<td>White Door Caulk</td>
<td>Kitchen</td>
</tr>
<tr>
<td>12</td>
<td>White Door Caulk</td>
<td>Kitchen</td>
</tr>
<tr>
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<td>Foil-Backed Pipe Wrap</td>
<td>Kitchen Storage Room 161D</td>
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<td>14</td>
<td>Foil-Backed Pipe Wrap</td>
<td>Kitchen Storage Room 161D</td>
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<td>15</td>
<td>Foil-Backed Pipe Wrap</td>
<td>Kitchen Storage Room 161D</td>
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<td>16</td>
<td>6&quot; Ceramic Floor Tile and Thin Set</td>
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</tr>
<tr>
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<td>Gray Window Caulk</td>
<td>Kitchen</td>
</tr>
<tr>
<td>20</td>
<td>2' x 4' Pinhole Punch Ceiling Tile</td>
<td>Hallway behind Kitchen</td>
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<td>21</td>
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<tr>
<td>22</td>
<td>Plaster Ceiling above 2' x 4' Pinhole Punch Ceiling Tile</td>
<td>Hallway behind Kitchen</td>
</tr>
<tr>
<td>23</td>
<td>Plaster Ceiling above 2' x 4' Pinhole Punch Ceiling Tile</td>
<td>Hallway behind Kitchen</td>
</tr>
<tr>
<td>24</td>
<td>12&quot; x 12&quot; Beige Feathered Floor Tile with Black Mastic</td>
<td>Hallway behind Kitchen</td>
</tr>
<tr>
<td>25</td>
<td>12&quot; x 12&quot; Beige Feathered Floor Tile with Black Mastic</td>
<td>Hallway behind Kitchen</td>
</tr>
<tr>
<td>26</td>
<td>4' Gray Cove Base with White Mastic</td>
<td>Hallway behind Kitchen</td>
</tr>
<tr>
<td>27</td>
<td>4' Gray Cove Base with White Mastic</td>
<td>Hallway behind Kitchen</td>
</tr>
<tr>
<td>28</td>
<td>12&quot; x 12&quot; Green/Yellow Floor Tile and Brown Leveling Compound</td>
<td>Storage Room 161E</td>
</tr>
<tr>
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<td>12&quot; x 12&quot; Green/Yellow Floor Tile and Brown Leveling Compound</td>
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Appendix V: Certifications/Licenses
DPOR License Lookup License Number 3303004293

License Details

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DPOR License Lookup build 1,198 (built 2017-07-13 02:34:41).
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 SUMMARY

A. Provide labor, materials, equipment and services necessary for and reasonably incidental to the completion of all cast-in-place concrete work shown or herein specified. The work includes all concrete poured in place with the required reinforcement called for on the drawings, concrete forms and forming, concrete over metal decking, pads under mechanical and electrical equipment and special pads as shown and noted on drawings. Coordinate concrete work with other trades and ensure the insertion of all cast-in-place items at the proper time.

1.03 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.04 QUALITY ASSURANCE

A. Contractor Qualifications: A company who specializes in the placement of formwork, reinforcing steel, and concrete with a minimum of 3 years experience on projects of a similar size and scope.

B. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified. ACI 301 'Specifications for Structural Concrete for Buildings'; ACI 117 'Specifications for Tolerance for Concrete Construction and Materials, and CRSI Concrete Reinforcing Steel Institute, 'Manual of Standard Practice'.

C. Workmanship: The Contractor is responsible for correction of concrete work which does not conform to the specified requirements, including strength, tolerances and finishes. Correct deficient concrete as directed by Architect.

D. Materials and Installed work may require testing and retesting, as directed by Architect, at anytime during progress of work. Allow free access to material stockpiles and facilities. Tests, not specifically indicated to be done at Owner's expense, including retesting of rejected materials and installed work, shall be done at Contractor's expense.
E. Protection of Footings Against Freezing: Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against possibility of freezing; maintain cover for time period as necessary.

F. Protect adjacent finish materials against spatter during concrete placement.

1.05 SUBMITTALS

A. Shop Drawings - Reinforcement: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required at openings through concrete structures and construction joints. Show wall reinforcing in elevations, in addition to section.

1. Structural design drawings shall not be reproduced or used as base sheets for shop drawings.

2. CAD files of the structural drawings are available for use by the contractor for a standard processing fee. If files are desired, contact Ehlert/Bryan, Inc. at 703-827-9552.

B. Samples: Upon request, submit samples of chairs, spacers, waterstops, joint materials, and other materials as requested by Architect, including names, sources and descriptions.

C. Mix Design: Submit mix designs for all classes of concrete including aggregate gradation and actual properties.

D. Certification for Admixture: Provide material certification, signed by manufacturer and contractor, certifying that each admixture complies with, or exceeds, specified requirements. Chloride ion content must be included.

E. Related Materials: Upon request, submit cut sheets and product information on curing compounds, patching and bonding materials, sealers, minutes of preconstruction conference, and other items.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.

B. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
C. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible trademark of an approved inspection agency.

D. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will be compatible with and not impair subsequent treatments of concrete surfaces, such as sealants or dampproofing.

E. Form Ties: Steel wire snap ties with positive breakbacks which will leave no metal closer than 1" from formed surface of concrete, leaving a cone-shaped recess.

2.02 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A615 615M, Grade 60 (Grade 420) deformed.


2.03 REINFORCING ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.

B. Joint Dowel Bars: Plain-steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). Saw (do not shear) bars true to length with ends square and free of burrs.

2.04 CONCRETE MATERIALS

A. Portland Cement: ASTM C150, Type I. Use one brand of cement throughout project.

B. Blended Hydraulic Cement: ASTM C595M, Type 1S or 1P.

C. Fly Ash: ASTM C618, Class C or F.

D. Granulated Blast Furnace Slag: ASTM C989 Grade 120

E. Normal Weight Aggregates: ASTM C33, and as herein specified. Maximum aggregate size 1" for all concrete.

1. Local aggregates not complying with ASTM C 33 but which have shown by special test or actual service to produce concrete adequate strength and durability may be used when acceptable to the Architect.

F. Lightweight Aggregate: ASTM C330

1. Nominal Maximum aggregate size: 1 inch.
G. Water: Potable and complying with ASTM C 94.

2.05 ADMIIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.


C. Water-Reducing Admixture: ASTM C 494, Type A.

D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.

F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

G. Calcium Chloride: Calcium chloride, thiocyanates or admixtures containing more than 0.10% water soluble chloride ions by weight of total cementitious materials are not permitted. The use of calcium chloride in concrete is prohibited.

2.06 RELATED MATERIALS

A. Vapor Barrier: Provide moisture barrier cover over prepared base material. Use only materials which are resistant to decay when tested in accordance with ASTM E 154. Polyethylene sheet not less than 10 mils thick.


C. Membrane-Forming Curing and Sealing Compound: ASTM C309. The compound shall be an acrylic emulsion blend, high solids (15% solids content minimum), low VOC (700 g/maximum) type curing and sealing compound. (Sodium Silicate Compounds are prohibited.) Acceptable products or approved equal. "Super Aqua-Cure VOX"; Euclid Chemical Company, "Cure and Seal 309 WB"; Symons Corporation, "Kure-N-Seal WB"; Sonneborn Building Products.

D. Dissipating Resin Curing Compound: ASTM 209. The compound shall be a liquid membrane forming curing compound formulated from hydrocarbon resins that breaks down quickly to allow the subsequent application of floor coverings. Acceptable products or approved equal. "Kurez DR VOX"; Euclid Chemical Company,

E. Bonding Compound: Polyvinyl acetate or acrylic base, rewettable type, for use only in areas not subject to moisture. Acceptable products or approved equal "Eucoweld"; Euclid Chemical Company. "Weldcrete"; By the Lamson Company.
F. Epoxy Adhesive: ASTM C881, two component material suitable for use on dry or damp surfaces. Acceptable products or approved equal; "Sikadur Hi-Mod"; Sika Chemical Corp., "Euco Epoxy #452 or #620"; Euclid Chemical Company.


2.07 PROPORTIONING AND DESIGN OF MIXES

A. Mix Designs: Prepare mix designs for each type of strength of concrete. All mix designs shall be proportioned in accordance with Section 5.3, "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318.

B. Limit use of fly ash to not exceed 25 percent of total cementitious material content by weight.

C. Limit use of blast furnace slag to 50 percent of total cementitious material content by weight. Use of ground blast furnace slag in interior slabs is not permitted.

D. Contractor is cautioned to carefully consider the use of Blended Hydraulic Cements during cold weather due to its tendency to retard concrete curing. The Contractor and the concrete supplier are responsible for selecting the concrete design mix to prevent problems with curing and finishing during cold weather.

E. Submit written reports to the Architect of each proposed mix for each class of concrete at least 30 days prior to start of work. Do not begin concrete production until mixes have been reviewed by the Architect. Reports shall include organic content, sieve analysis, specific gravity of aggregates; proportion of all materials; brand of cement; admixtures; slump; water/cement ratios; percentage of air, and results of 7-day and 28-day compression tests.

F. Strength: Concrete shall have compressive strengths at 28 days as shown on structural drawings.

G. Water/Cement Ratio: All concrete shall have a water/cement ratio not to exceed 0.58, except concrete for garages, exterior plazas, and concrete exposed to freezing and thawing shall have a water/cement ratio not exceeding 0.40.

H. Air Content: All concrete exposed to freezing and thawing and/or required to be watertight shall have an air content of 6 +/- 1.5 percent.

I. Admixture Usage: All concrete shall contain the specified water reducing admixture and/or the specified high range water reducing admixture (superplasticizer). All concrete required to be air entrained shall contain an approved air entraining admixture. All pumped concrete, concrete for industrial slabs, architectural concrete, concrete required to be watertight and concrete with a water/cement ratio below 0.50 shall contain the specified HRWR (superplasticizer).

J. Limit water soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
K. Adjustment to Concrete Mixes: Mix design and adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and reviewed by the Architect prior to use.

L. Slump Limits: All concrete shall have a maximum slump of 5 inches (4 inches +/- 1 inch), except concrete containing HRWR admixture (super plasticizer) which shall have a slump not more than 8 inches after addition of HRWR to site-verified 2-3 inch slump concrete.

2.08 CONCRETE MIXING

A. Ready-Mix Concrete: Comply with the requirements of ASTM C94, and as herein specified. Furnish batch ticket information.

1. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required. When the air temperature is above 85 degrees F., reduce the mixing and delivery time from 90 to 60 minutes.

2. For concrete materials arriving at site with insufficient slump, the one time limited addition of water is permitted. Add up to 10 gallons of water per 9 yard truck to increase slump to specified limits. Such additions shall be clearly noted on the delivery ticket.

PART 3 - EXECUTION

3.01 FORMS

A. Design, erect, support, brace and maintain formwork according to ACI 301 to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.

B. Form Ties: Install ties to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

C. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.

D. Coat contact surfaces of forms with a form coating compound before reinforcement is placed.

3.02 PLACING REINFORCEMENT

A. Comply with specified codes and standards, and comply with Concrete Reinforcing Steel Institute's Manual of Standard Practice for placing reinforcements.
B. Clean reinforcement of loose rust and mill scale, earth, ice and other materials, which reduce or destroy bond with concrete.

C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations before concrete is placed. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required. “Wet” placement of rebar is prohibited.

D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. Concrete cover: Protect reinforcing by thickness of concrete indicated on drawings. Where not otherwise shown thickness over reinforcement shall be as follows:

Provide clear distance to outermost reinforcing as follows:

Concrete Cast Against Earth………………….. 3 inches

Concrete Exposed to Earth or Weather:

#5 or smaller …………………………… ……….1-1/2 inches
#6 or Larger…………………………….. 2 inches

Other Concrete:

Slabs & Walls ……………………………………3/4 inches
Beams & Columns ……………………………1-1/2 inches

F. In Slabs-on-Grade: Place reinforcing in top 1/3 of depth unless otherwise noted.

G. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.03 JOINTS

A. Construction and Control Joints - Walls and Slab on Grade: Locate and install as indicated or, if not indicated, so as not to impair the strength and appearance of the structure, as acceptable by the Architect.

3.04 INSTALLATION OF EMBEDDED ITEMS

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.
3.05 CONCRETE PLACEMENT

A. Pre-placement Inspection: Before placing concrete, inspect and complete the formwork installation, reinforcing steel and items to be embedded or cast-in. Notify other crafts to permit the installation of their work; cooperate with other trades in setting such work, as required. Clean all formwork of excess water and miscellaneous debris. Thoroughly wet wood form immediately before placing concrete as required where form coatings are not used.

B. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

C. General: Comply with ACI 304 and as herein specified.

D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

E. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spacing, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with the recommended practices of ACI, to suit the type of concrete and project conditions.

F. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within the limits of construction joints, until the placing of a panel or section is completed.

G. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

H. Bring slab surfaces to the correct level with a straightedge and strikeoff. Use bull floats or darbys to smooth the surface, leaving it free of humps or hollows. Do not sprinkle water on the plastic surface. Do not disturb the slab surfaces prior to beginning finishing operations.

I. Maintain reinforcing in the proper position during concrete placement operations.

J. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified. When air temperature has fallen to or is expected to fall below 40 degrees F, uniformly heat all water and aggregates before mixing as required to obtain a concrete mixture temperature of not less than 50 degrees F and not more than 80 degrees F at point of placement.

K. Hot Weather Placing: When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F. Mixing water may be chilled, or chopped ice may be used to control the concrete temperature provided the water equivalent of the ice is calculated to the total amount of mixing water. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air...
temperatures immediately before embedment in concrete. Wet forms thoroughly before placing concrete. Do not use retarding admixtures unless accepted in mix designs.

3.06 MONOLITHIC SLAB FINISHES

A. General: Comply with recommendations in ACI 302.1R for screeding, restrengthening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Apply float finish to monolithic slab surfaces that are to receive trowel finish and other finishes as hereinafter specified and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo and as otherwise indicated.

1. After screeding and consolidating and leveling concrete slabs, do not work surface until ready for floating. Begin floating using float blades or float shoes only when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Cut down high spots and fill low spots. Uniformly slope surfaces to drain, if applicable. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

C. Trowel Finish: Apply trowel to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint or other thin film finish coating system.

1. After floating begin first trowel finish operation using a power-driven trowel. Begin final trowelling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance.

D. Trowel and Fine Broom Finish: Where ceramic or stone is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.

E. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps and elsewhere as indicated. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

F. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

G. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.07 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperature and maintain without drying at a relatively constant temperature for a
period of time necessary for hydration of cement and proper hardening. Start curing as soon as free water has disappeared from concrete surface after placing and finishing. Continue curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of curing period.

B. Curing shall be by application of the specified membrane-forming curing and sealing compound, the specified dissipating resin curing compound or by application of waterproof sheet materials conforming to ASTM C 171-80.

C. Liquid membrane-forming curing and sealing compounds shall be applied in accordance with the manufacturer's recommendations. Interior slabs with resilient tile, carpet or left exposed and all exterior slabs, sidewalks, curbs, etc. shall be cured with the specified membrane-forming curing and sealing compound.

D. Any membrane-forming curing and sealing compound used in floor slabs receiving applied finish flooring shall be guaranteed by the manufacturer, in writing, not to impair bonding of adhesive.

E. For slabs, which are to receive terrazzo, bonded cementitious materials, epoxy or urethane coatings, liquid floor hardener, or waterproofing, use a curing treatment of moisture-retaining covers or the specified dissipating resin curing compound.

F. The curing compounds must be applied immediately after final finishing. For curing by the waterproof sheet material, the concrete must be continually moist-cured for a minimum of 7 days. The curing process must begin immediately after final finishing.

G. Sealer and Dustproofer: Apply a second coat of specified membrane-forming curing and sealing compound only to surface indicated to receive sealer-dustproofer finish.

3.08 REMOVAL OF FORMS

A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provide curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements may not be removed until the concrete has reached its design strength.

3.09 MISCELLANEOUS

A. Filling-In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.010 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.

PART 4 - QUALITY CONTROL

4.01 TESTING DURING CONSTRUCTION

A. The Owner will employ a testing laboratory to perform tests and to submit test results.

B. Sampling and testing for quality control during placement of concrete shall include the following.

1. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.

2. Slump: ASTM C143; up to one test for each concrete load at point of discharge; and one test for each set of compressive strength test specimens.

3. Air Content: ASTM C173, volumetric method for lightweight or normal weight concrete; ASTM C231 pressure for normal weight concrete; one for each set of compressive strength test specimens.

4. Concrete Temperature: Test hourly when air temperature is 40 degrees F and below, and when 80 degrees F and above; and each time a set of compression test specimens made.

5. Compression Test Specimen: ASTM C31, one set of 6 standard cylinders for each strength test, minimum.

6. Compressive Strength Tests: ASTM C39, one set for each 75 cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 5,000 sq. ft. of surface area placed; two specimens tested at 7 days, two specimens at 28 days and two specimens retained in reserve for later testing if required. Additional cylinders shall be formed as required for early stripping by the Contractor.

C. Test Results will be reported in writing to Architect, Structural Engineer and Contractor within three working days that tests are made. Reports of compressive strength tests shall contain the project identification, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day and 28-day tests.

D. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been
attained in the structure, as directed by Architect. Testing service may conduct tests to
determine adequacy of concrete by cored cylinders complying with ASTM C42, or by
other methods as directed. Contractor shall pay for such tests conducted, any other
additional testing as may be required, and extra engineering and architectural services
related to evaluating the problem and developing an acceptable solution.

E. The contractor shall be responsible for scheduling with the testing laboratory, and shall
provide free access for its personnel and labor required in helping to obtain and handle
samples of concrete.

END OF SECTION 033000
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:
   1. Concrete masonry units (CMUs).
   2. Building (common) brick.
   3. Mortar and grout.
   4. Reinforcing steel.
   5. Masonry joint reinforcement.
   6. Ties and anchors.
   7. Flashing.
   8. Miscellaneous masonry accessories.

B. Products installed, but not furnished, under this Section include the following:
   1. Steel lintels and shelf angles for unit masonry, including welded end dams, furnished under Division 05 Section "Metal Fabrications".

1.03 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.04 SUBMITTALS

A. Product Data: For the following:
   1. Each type of unit masonry
   2. Accessories
   3. Other manufactured products

B. Samples for Initial Selection: For the following:
   1. Face Brick
   2. Colored mortar.

C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

D. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.05 QUALITY ASSURANCE

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these
characteristics, through one source from a single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

C. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.07 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover openings and exposed masonry with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
   2. Where 1 wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in Section 2104.3 in the International Building Code.
   1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.


PART 2 - PRODUCTS

2.01 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.02 CONCRETE MASONRY UNITS (CMUS)

A. Shapes: Provide shapes indicated and as follows:
   1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
   2. Provide square-edged units for outside corners, unless otherwise indicated.

B. Concrete Masonry Units:
   1. Weight Classification: Normal Weight, unless otherwise indicated.
   2. Reference Standard:
      a. Load-bearing: ASTM C90
      b. Non-load bearing: ASTM C129
   3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
      a. Nominal Dimensions: 8 by 8 by 16.
      b. Nominal Dimensions: 12 by 8 by 16.

2.03 BRICK

A. General: Provide shapes indicated and as follows:
   1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
   2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
   3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Building (Common) Brick:
   1. Size (Actual Dimensions): 3-5/8 inches wide by 2-3/4 inches high by 7-5/8 inches long, meeting the requirements of ASTM C216, Grade SW, Type FBS.
   2. Product: Match Existing Face Brick.

2.04 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207 Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.

D. Masonry Cement: ASTM C 91

E. Mortar Cement: ASMT C 1329

F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979. Use only pigments with a record of satisfactory performance in masonry mortar.

G. Colored Cement Product: Packaged blend made from portland cement and hydrated lime cement or mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
   1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
   2. Pigments shall not exceed 10 percent of portland cement by weight.
   3. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.

H. Aggregate for Mortar: ASTM C 144.
   1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
   2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

I. Aggregate for Grout: ASTM C 404.

J. Water: Potable.

2.05 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Masonry Joint Reinforcement, General:
   1. Interior Walls: Mill-galvanized, carbon steel.
   2. Exterior Walls: Hot dip galvanized, carbons steel
5. Wire Size for Veneer Ties: 0.187-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

D. Masonry Joint Reinforcement for Multi-wythe Masonry:
   1. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle and eye connections having a maximum adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.

2.06 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with subparagraphs below, unless otherwise indicated.
   2. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 Zinc coating.
   3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
   4. Stainless-Steel Bars: ASTM A276 or ASTM A 666, Type 304.

B. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
   1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, stainless-steel wire. Mill-galvanized wire may be used at interior walls, unless otherwise indicated.
   2. Tie Section for Steel Frame: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.188-inch-diameter, stainless-steel wire with high-strength plastic wing-nut. Mill-galvanized wire may be used at interior walls, unless otherwise indicated.

C. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins, unless otherwise indicated.

2.07 MISCELLANEOUS ANCHORS

A. Anchor Bolts: Headed steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

2.08 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
   1. Stainless Steel : ASTM A240/A240M, Type 304, 0.016 inch thick
2. Fabricate continuous flashing in section 6-inches long minimum, but not exceeding 12-feet. Provide splice plates at joints of formed, smooth metal flashing.
3. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
   a. Products:
      1) Cheney Flashing Company; Cheney Flashing (Dovetail) or Cheney 3-Way Flashing (Sawtooth).
4. Metal Drip Edges: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.

B. Solder and Sealants for Sheet Metal Flashings: As specified in Division 07 Section "Sheet Metal Flashing and Trim".
   1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.

C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.09 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Weep/Vent Products: Use the following, unless otherwise indicated:
      a. CellVent by Mortar Net Solutions
      b. CELLVENT by Blok-Lok
      c. QV-Quadro-Vent by Hohmann & Barnard, Inc.

D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.

2.10 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
   a. Use products expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units.
2.11 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Limit cementitious materials in mortar to portland cement and lime.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, and with BIA Technical Notes 8A, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
   1. For masonry below grade or in contact with earth, use Type S.
   2. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
   3. For interior non-load-bearing partitions, Type O may be used instead of Type N.

D. Pigmented mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
   1. Pigments shall not exceed 10 percent of portland cement by weight
   2. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.

E. Grout for Unit Masonry:
   1. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
   1. Verify that foundations are within tolerances specified.
   2. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

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

3.02 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.
C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
   1. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying. Dipping brick in water just prior to laying is not permitted.

H. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:
   1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
   2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
   3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
   4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
   5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
   6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
   7. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.03 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than half of the nominal length of horizontal face dimensions at corners or jambs.
C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

G. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
   1. Install compressible filler in joint between top of partition and underside of structure above.
   2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 16 inches o.c., unless otherwise indicated.
   3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

3.04 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:
   1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
   2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
   3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
   4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.05 DOUBLE WYTHE WALLS

A. Bond wythes of walls together using the following method:
      a. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement with continuous horizontal
wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.

3.06 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
   1. Space reinforcement not more than 16 inches o.c.
   2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
   3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.07 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
   1. Provide an open space not less than 1/2 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
   2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
   3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.08 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to masonry backup with masonry-veneer anchors to comply with the following requirements:
   1. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
   2. Space anchors as indicated, but not more than 18 inches o.c vertically and 16 inches o.c horizontally, with not less than 1 anchor for each 2 sq ft of wall area. Install additional anchors within 12 inches of openings and expansion joints. And at intervals not exceeding 8 inches around perimeter.

3.09 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
   1. Install control and expansion joints in accordance with the following:
      a. Not greater than 20 feet apart, in any direction.
      b. Not greater than 4 feet-6 inches from any outside corner.
      c. All inside building corners, particularly at wall piers and columns.
d. At any main or intersecting building walls.

e. To the far side or corner of any large wall opening or window.

2. Joints shall be continuous through dissimilar veneer masonry materials, and concealed with the use of color-matching sealant as specified in Division 07 Section “Joint Sealing”.

3. Information on Drawings and in Specifications establishes requirements for control and expansion joints' aesthetic effects. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of joints as they relate to sightlines, to one another, and to adjoining construction.

a. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If control or expansion joint quantities or locations (or both) are proposed to be modified from those indicated on the Drawings, submit comprehensive explanatory data to Architect for review.

b. Methods of fabrication and assembly are at the Contractor’s discretion, provided that the exterior and interior visible aesthetic effects are not altered, the work of others is not affected, and that control and expansion joints’ weather tightness and strength qualities, as demonstrated by engineering calculations and measured by the results of tests for performance, are not reduced.

B. Form control joints in concrete masonry using one of the following methods:

1. Install preformed control-joint gaskets designed to fit standard sash block.
2. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

C. Form expansion joints in brick made from clay or shale as follows:

1. Build in compressible joint fillers 3/8 inch compatible with use as backer for sealant specified in Division 07 Section "Joint Sealing".

D. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 07 Section "Joint Sealing”

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.10 LINTELS

A. Install steel lintels where indicated and where openings of more than 8 inches for brick-size units and 12 inches for CMU units are shown without structural steel or other supporting lintels.

B. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.11 FLASHING AND WEEP VENTS

A. General: Install embedded flashing and weep vents in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Install flashing as follows, unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and 1-1/2 inches into the inner wythe. Form 1/4-inch hook in edge of flashing embedded in inner wythe.

3. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.

4. Install metal drip edges and sealant stops with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Division 07 Section "Joint Sealing" for application indicated.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Install vents in head joints in exterior wythes at 16 inches on center, maximum. Use specified vent products to form vents.

3.12 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.

2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

2. Limit height of vertical grout pours to not more than 60 inches.

3.13 REPAIRING, POINTING AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
6. Clean stone trim to comply with stone supplier's written instructions.

3.14 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION 04 20 00
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Miscellaneous steel framing and supports.
      a. Steel framing and supports for mechanical and electrical equipment.
      b. Steel framing and supports for applications where framing and supports are not specified in other Sections.
   2. Loose bearing and leveling plates.
   3. Loose steel lintels
   4. Aluminum handrails

1.03 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Handrails:
      a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
      b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.
   2. Top Rails of Guards:
      a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied horizontally and concurrently with 100 lbf/ ft. (1.46 kN/m) applied vertically downward.
      b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.
   3. Infill Area of Guardrail Systems:
      a. Capable of withstanding a horizontal concentrated load of 200 pounds applied to one square foot at any point in the system including panels, intermediate rails balusters, or other elements composing the infill area.

1.04 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Paint products.
   2. Grout.
3. Aluminum Railing

B. Shop Drawings: Show fabrication and installation details for metal fabrications.
   1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

PART 2 - PRODUCTS

2.01 METALS, GENERAL
   A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.

2.02 FERROUS METALS
   A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
   B. Steel Tubing: ASTM A 500, Grade B, cold-formed steel tubing.
   C. Steel Pipe: ASTM A 53/A 53M, Grade B, standard weight (Schedule 40) unless otherwise indicated.
   D. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M.

2.03 NONFERROUS METALS
   A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
   C. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.
   E. Aluminum Tube Railing: Extruded type; Brushed Satin finish / Anodized.
      1. Provide Standard Weight (Schedule 40) pipe, unless otherwise indicated.

2.04 FASTENERS
   A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls.
      1. Provide stainless-steel fasteners for fastening aluminum.
      2. Provide stainless-steel fasteners for fastening stainless steel.
   B. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
   C. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.


2.05 MISCELLANEOUS MATERIALS

A. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
   1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Products:

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
   1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Products:
      a. Carboline Company; Carbozinc 621.
      b. ICI Devoe Coatings; Catha-Coat 313.
      d. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.


E. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.06 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.

C. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended.

D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.
E. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 24 inches (600 mm) o.c.

2.07 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

2.08 HANDRAILS

A. Railing shall be smooth with welded connections. Welded connections shall be ground smooth with no visible grind markings. Joints shall be flush, with concealed fittings.

B. Railing shall be constructed of aluminum members of sizes and shapes indicated.

C. Posts at concrete shall be set plumb in pipe sleeves with non-shrink grout.

D. Rails shall run continuously to each post.

E. Fabricate handrails to provide end returns to wall.

F. Handrail brackets: Malleable iron or steel, standard units, complete with mounting plates and anchoring accessories. Handrails shall be secured to masonry and concrete surfaces by wall brackets with expansion bolts.

2.09 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

C. Galvanize exterior miscellaneous steel trim.

D. Prime exterior miscellaneous steel trim with zinc-rich primer.

2.10 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
2.11 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Hot-dip galvanize loose steel lintels located in exterior walls, in accordance with ASTM A123.

C. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.12 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.13 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

B. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
   1. Shop prime with universal shop primer unless zinc-rich primer is indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
   3. Items Indicated to Receive Primers Specified in Division 09 Section "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

2.14 ALUMINUM FINISHES

A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
   1. Clear Anodic Finish: AAMA 611, AA-M12C22A41

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and
elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.02 INSTALLING BEARING AND LEVELING PLATES


B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

C. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.03 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.04 ANCHORING POSTS

A. Use metal sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
B. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

C. Cover anchorage joint with flange of same metal as post, attached to post with set screws.

D. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
   1. For aluminum pipe railings, attach posts using fittings designed and engineered for this purpose.

3.05 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 50 00
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

   A. This Section includes the following:
      1. Wood blocking and nailers.
      2. Plywood backing panels.

1.03 DEFINITIONS

   A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise indicated.

   B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
      1. NELMA - Northeastern Lumber Manufacturers Association.
      2. NLGA - National Lumber Grades Authority.

1.04 SUBMITTALS

   A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
      1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
      2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
      3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
      4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.05 QUALITY ASSURANCE

   A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
B. Source Limitations for Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product through one source from a single producer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.01 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.
5. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

B. Wood Structural Panels:
1. Plywood: DOC PS 1.
2. Oriented Strand Board: DOC PS 2.
3. Thickness: As needed to comply with requirements specified but not less than thickness indicated.
5. Factory mark panels according to indicated standard.

2.02 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA C2 (lumber) and AWPA C9 (plywood), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and one of the following:
   a. Ammoniacal, or amine, copper quat (ACQ).
   b. Copper bis (dimethylthiocarbamate) (CDDC).
   c. Ammoniacal copper citrate (CC).
   d. Copper azole, Type A (CBA-A).
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.
C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.
   1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

D. Application:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

2.03 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, provide materials that comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D5664, for lumber and ASTM D5516, for plywood.
   2. Use treatment that does not promote corrosion of metal fasteners.
   3. Use Exterior type for exterior locations and where indicated.
   4. Use Interior Type A High Temperature (HT), unless otherwise indicated.

B. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

2.04 DIMENSION LUMBER

A. General: Provide dimension lumber of grades indicated according to the American Lumber Standards Committee National Grading Rule provisions of the grading agency indicated.

2.05 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.
   3. Furring.

B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 19 percent maximum moisture content and any of the following species:
   1. Hem-fir or Hem-fir (north); NLGA, WCLIB, or WWPA.
   2. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and the following species and grades:
   1. Northern species, No. 2 Common grade; NLGA.
D. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.06 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch thick.

2.07 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
   1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
   2. For fasteners used with preservative-treated wood provide fasteners galvanized to meet requirements of ASTM A 653/A 653M, G90.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: CABO NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Lag Bolts: ASME B18.2.1.

G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

2.08 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturers.
   1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for
accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. CABO NER-272 for power-driven fasteners.
   2. Published requirements of metal framing anchor manufacturer.

E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

3.02 WOOD BLOCKING AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build anchor bolts into masonry during installation of masonry work. Where possible, secure anchor bolts to formwork before concrete placement.
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary
   Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Solid surface countertops
   2. Plastic-laminate base panels.
   3. Resin infill panel at guardrail.

1.03 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging
   strips for installing woodwork items unless concealed within other construction before
   woodwork installation.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated, including cabinet hardware and
   accessories.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, details,
   attachment devices, and other components.
   1. Key Plans: 1/8" = 1'-0".
   2. Plans: 1/2" = 1'-0".
   3. Elevations: 1/2" = 1'-0".
   4. Plan Sections: 3" = 1'-0".
   5. Details: Full size or 3" = 1'-0".
   6. All finish hardware, anchors, fastenings and accessories.
   7. Show locations and sizes of furring, blocking, and hanging strips, including
      concealed blocking and reinforcement specified in other Sections.
   8. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets,
      soap dispensers, and other items installed in architectural woodwork.

C. Samples:
   1. Plastic laminates
      a. Selection: 2 x 3 inches
   2. Solid Surface
      a. Selection: 2 x 2 inches.

D. Maintenance Data: Submit solid polymer manufacturer’s care and maintenance and
   cleaning instructions. Include in Project close-out documents.
1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Certified participant in AWI's Quality Certification Program. Installation shall be by the fabricator of the cabinetwork.

B. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production and installation of interior architectural woodwork with sequence-matched wood veneers and wood doors with face veneers that are sequence matched with woodwork.

   1. Provide AWI Quality Certification Program labels and certificates indicating that woodwork, including shop drawings and installation, complies with requirements of grades specified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
   2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.08 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.
PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Provide materials that comply with requirements of AWS's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. **Wood substrate:** Comply with the following:
   1. Softwood Plywood: DOC PS 1
      a. Veneer Plywood, Exterior Marine Grade B-B.

C. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
   1. Manufacturers:
      a. Formica Corporation.
      b. Nevamar Company, LLC; Decorative Products Div.
      c. Wilsonart International; Div. of Premark International, Inc.

D. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
   1. Manufacturers:
      a. Avonite Surfaces.
      c. Formica Corporation.
      d. LG Chemical, Ltd.
      e. Wilsonart LLC.

2.02 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this Article, which are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified.
   1. Do not use treated materials that do not comply with requirements of referenced woodworking standard or that are warped, discolored, or otherwise defective.
   2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
   3. Identify fire-retardant-treated materials with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

B. Fire-Retardant-Treated Lumber and Engineered Wood Panels by Pressure Process: Comply with performance requirements of AWPA C20 (lumber) and AWPA C27 (engineered wood panels). Use the following treatment type:
   1. Interior Type A: Low-hygroscopic formulation.
   2. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.
   3. Kiln-dry materials before and after treatment to levels required for untreated materials.
2.03 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Structural Supports: Angle steel, minimum 0.125-inch thickness and sized to provide concealed support for countertops, lavatory tops, ledges, and other woodwork fabrications. Fully weld angles and braces into a single support, and pre-drill holes for anchors into building structure and into woodwork.

C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

D. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Wood Glues: 30 g/L.
   2. Contact Adhesive: 250 g/L.

E. Adhesive for Bonding Plastic Laminate: Contact cement.
   1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

F. Grommets: Metal brush desk grommet.

2.04 PLASTIC-LAMINATE BASE PANELS

A. Quality Standard: Comply with AWS Section 10 requirements for laminate cabinetwork.
   1. Grade: Custom.

B. AWS Type of Cabinet Construction: Style 1 flush overlay on Type A frameless cabinet body, with laminated square edges on doors and drawer fronts.

C. Panel Material: Medium density overlay, exterior type, or veneer plywood, exterior type.

D. Laminate Cladding for Exposed and Semi-exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
   1. Horizontal Surfaces Other Than Tops: Grade HGS.
   2. Postformed Surfaces: Grade HGP.
   3. Vertical Surfaces: Grade HGS.
   4. Edges: PVC edge banding, 3 mm thick, matching laminate in color, pattern, and finish.

E. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.
F. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces as scheduled.

2.05 SOLID SURFACING COUNTERTOPS

A. Quality Standard: Comply with AWS requirements for solid surface countertops.
   1. Grade: Custom.

B. Configuration:
   1. Front: Straight, slightly eased at top

C. Countertops: 3/4-inch-thick, solid surface material with front edge built up with same material. Architect to select up to one color.

D. Core Material:
   1. At Dry Areas (Countertops with no sinks): Minimum 3/4-inch (19-mm) particleboard made with exterior glue.

E. Provide countertops made of solid surfacing materials, eased edge. Provide built-up front edge and ¼ inch material laminated to core material with Type II adhesive. Provide holes for access grommets.

2.06 RESIN INFILL PANELS

A. Basis-of-Design Product: “Varia Ecoresin” Translucent Resin Panel sheets by 3-Form, Inc., or pre-bid approved equal.
   1. Provide engineered co-polyester resin panels.
   2. Provide flat sheets, 1/2-inch thickness, minimum, and as indicated.
   3. Provide thickness required for stability in each use.

B. Color and Finish: To be selected by Architect from manufacturer’s full range of colors.

C. Pattern: None.

2.07 FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide Premium-grade interior woodwork complying with referenced quality standard. Provide wood veneers only within the range of the accepted samples, including providing select veneers if required to remain within that range.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

D. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
4. Splash Tops: Square edge at plastic laminate and slightly eased at solid surface material where splash tops are exposed.

E. Joints Between Countertop and Backsplash and Side Splashes
   3. Joint Between All Countertop Types and All Side Splash Types: Horizontal butt joint. Provide chemical seal at solid surface joints.

F. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
   1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
   2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

G. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
   1. Seal edges of openings in countertops with a coat of varnish.

2.08 SHOP FINISHING

A. Grade: Provide finishes of same grades as items to be finished and in accordance with AWS Section 5.

B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
   1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.

PART 3 - EXECUTION

3.01 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.02 INSTALLATION

A. Installation Quality Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

F. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

3.03 COUNTERTOP INSTALLATION

A. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

B. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

C. Install aprons to backing and countertops with adhesive.

D. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

E. Apply sealant to gaps at walls

3.04 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Penetrations in fire-resistance-rated walls, partitions and barriers.
   2. Penetrations in horizontal assemblies.
   3. Penetrations in smoke barriers.
   4. Labeling of penetrations.
   5. Design of penetration firestopping systems.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.
   1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.04 INFORMATIONAL SUBMITTALS

A. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

B. Product test reports.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
   1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
      a. Penetration firestopping tests are performed by UL in accordance with the assembly testing requirements of ASTM.
2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems bearing marking of qualified testing and inspection agency.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   2. Grace Construction Products.
   3. Hilti, Inc.
   6. NUCO Inc.
   8. RectorSeal Corporation.
   9. Specified Technologies Inc.
   10. Thermafiber, Inc.
   11. 3M Fire Protection Products.
   13. USG Corporation.

2.02 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls, Partitions and Barriers: Ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
   1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
   1. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
   2. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
   1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at 0.30-inch wg (74.7 Pa) at both ambient and elevated temperatures.

E. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
F. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

G. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

2.03 FIRESTOP LABELING

A. Label each penetration with information as required by local code, including at least the fire rating of the partition through which the penetration is made, the product used to stop the penetration, and the UL listing number of the firestopping assembly.

B. Penetration Labeling: Provide labeling in size and with wording appropriate for each partition and floor-ceiling assembly on which sign is affixed. Provide signs as required by code for each partition using contrasting-color spray paint and stencils.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

D. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

E. Penetrations in Fire-Resistance-Rated Walls for Electrical Boxes:

1. Each steel electrical box shall not exceed 16 square inches in total area and the total area of such openings does not exceed 100 square inches for any 100 square feet of wall area.
2. Cut opening in gypsum board such that the clearance between the box and the gypsum board does not exceed 1/8 inch.
3. Separate steel electrical boxes on opposite sides of a partition at least 24 inches horizontally, or by a horizontal distance of not less than depth of the wall cavity if filled with cellulose loose fill or mineral wool insulation.

3.02 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections.
B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.03 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to the alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ.
B. Firestop Systems with No Penetrating Items Comply with the following:
   1. UL-Classified Systems: C-AJ-, C-BJ-, F-A-, W-J-, W-L-.
C. Firestop Systems for Metallic Pipes, Conduit, or Tubing Comply with the following:
D. Firestop Systems for Nonmetallic Pipe, Conduit, or Tubing Comply with the following:
E. Firestop Systems for Electrical Cables Comply with the following:
F. Firestop Systems for Cable Trays Comply with the following:
G. Firestop Systems for Insulated Pipes: Comply with the following:
H. Firestop Systems for Miscellaneous Electrical Penetrants Comply with the following:
   1. UL-Classified Systems: C-AJ-, F-A-, W-L-.
I. Firestop Systems for Miscellaneous Mechanical Penetrations Comply with the following:
   1. UL-Classified Systems: C-AJ-, F-C-, W-J-, W-L-.
J. Firestop Systems for Groupings of Penetrations Comply with the following:
PART 1 - GENERAL

1.01 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY
   A. This Section includes but is not limited to interior and exterior horizontal and vertical joint sealing.

1.03 SYSTEM PERFORMANCE REQUIREMENTS
   A. Provide joint sealants that have been produced and installed to establish and maintain continuous seals that cause no staining or deterioration of joint substrates.

1.04 SUBMITTALS
   A. Product data from manufacturers for each joint sealant product required.
      1. Certification by joint sealant manufacturer that sealants plus the primers and cleaners required for sealant installation comply with local regulations controlling use of volatile organic compounds.

   B. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.

   C. Samples for verification purposes of each type and color of joint sealant required. Install joint sealant samples in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

   D. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.

   E. Qualification data complying with requirements specified in "Quality Assurance" article. Include list of completed projects with project names addresses, names of Architects and Owners, plus other information specified.

   F. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

   G. Product test reports for each type of joint sealants indicated, evidencing compliance with requirements specified.
H. Preconstruction field test reports indicating which products and joint preparation methods demonstrate acceptable adhesion to joint substrates.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

B. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

C. Field-constructed Mock-Ups: Prior to installation of joint sealants, apply elastomeric sealants as follows to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution:
   1. Joints in field-constructed mock-ups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants specified in this Section.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.07 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40 deg F (4.4 deg C).
   2. When joint substrates are wet.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):
   1. Architectural Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.
B. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

C. Colors: Provide color of exposed joint sealants to comply with the following:
1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

2.02 JOINT SEALANTS

A. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
1. Provide products by one of the following:
   a. Dow Corning Corporation.
   b. Pecora Corporation.
   c. Sika Corporation; Joint Sealants.
   d. Tremco Incorporated.

B. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
1. Provide products by one of the following:
   a. BASF Corp. - Construction Chemicals.
   b. LymTal International Inc.

C. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
1. Provide products by one of the following:
   a. Pecora Corporation.
   b. Tremco Incorporated.

D. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
1. Provide products by one of the following:
   a. Dow Corning Corporation.
   b. Pecora Corporation.
   c. Tremco Incorporated.

2.03 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
1. Either flexible, open cell polyurethane foam or non-gassing, closed-cell polyethylene foam, unless otherwise indicated or as recommended by the sealant manufacturer.
C. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to -26 deg F (-32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.04 MISCELLANEOUS MATERIALS

A. Joint Cleaners: Provide joint cleaning compounds as recommended by sealant manufacturer(s).

B. Joint Prime Sealer: Provide type(s) of joint primers as recommended by sealant manufacturer(s).

C. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to the substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape wherever applicable.

D. Sealant Backer Rod: Compressible rod stock polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable non-absorptive material as recommended for compatibility with sealant by the sealant manufacturer. Provide size and shape of rod which will control the joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back side, and provide a highly compressible backer to minimize possibility of sealant extrusion from compressed joint.

E. Joint Filler: Provide expanded neoprene complying with ASTM D1056, Class SC (oil-resistant and medium swell), of 2 to 5 psi compression deflection (Grade SCE 41); except provide 13 to 17 psi compression deflection (Grade SCE 44) wherever filler is applied under sealant exposed to traffic.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Prior to work of this Section, carefully inspect the installed work of other trades and verify that such work is complete to point where this installation may properly commence. In the event of discrepancy do not proceed with installation until all such discrepancies have been fully resolved.

3.02 JOINT SURFACE PREPARATION

A. Clean joint surfaces immediately before installation of sealant. Remove dirt, insecure coatings, moisture and other substances which would interfere with bond of sealant.

B. For polyurethane sealants, do not proceed with installation of sealant over joint surfaces which have been painted, lacquered, waterproofed or treated with water repellent or other treatment or coating unless a laboratory test for durability (adhesion), in compliance with
Paragraph 4.3.9 of FS TT-S-227 has successfully demonstrated that sealant bond is not impaired by the coating or treatment. If laboratory test has not been performed, or shows bond interference, remove coating or treatment from joint surfaces before installing sealant.

C. Etch concrete surfaces to remove excess alkalinity, unless sealant manufacturer's printed instructions indicate that alkalinity does not interfere with sealant bond and performance. Etch with 5% solution of muriatic acid; neutralize with dilute ammonia solution, rinse thoroughly with water and allow to dry before sealant installation.

D. Roughen joint surfaces on non-porous materials, wherever sealant manufacturer's data indicates lower bond strength than for porous surfaces. Rub with fine abrasive cloth or wool to produce a dull sheen.

3.03 INSTALLATION

A. Comply with sealant manufacturer's printed instructions except where more stringent requirements are shown or specified and except where manufacturer's technical representative directs otherwise.

B. Prime or seal the joint surfaces wherever recommended by the sealant manufacturer. Do not allow primer/sealer to spill or migrate onto adjoining surfaces.

C. Install sealant backer rod for liquid elastomeric sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for the application shown.

D. Install bond breaker tape wherever shown and wherever required by manufacturer's recommendations to ensure that elastomeric sealants will perform properly.

E. Employ only proven installation techniques, which will ensure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of the joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.

F. Install sealants to depths as shown or, if not shown, as recommended by sealant manufacturer but within the following general limitations, measured at center section of bead.
   1. For normal moving joints sealed with one component silicone sealants, but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 1/2" deep nor less than 1/4" deep.
   2. For joints sealed with acrylic-latex sealant, fill joints to a depth in the range of 75% to 125% of joint width.

G. Spillage: Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either the primer/sealer or the sealant compound.

H. Remove excess and spillage of compounds promptly as work progresses. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes.

I. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and complying
with sealant manufacturer's directions for installation methods, materials and tools which produce seal continuity at ends, turns, and intersections of joints. For application at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.

3.04 CURE AND PROTECTION

A. Cure sealant compounds in compliance with manufacturer's instructions and recommendations, in order to obtain high early bond strength, cohesive strength and surface durability.

B. Adopt procedures as required for the curing and protection of sealants and caulking compounds during construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at time of Owner's acceptance.

3.05 JOINT-SEALANT SCHEDULE

   1. Joint Locations:
      a. Construction joints in cast-in-place concrete
      b. Control and expansion joints in unit masonry.
   2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

   1. Joint Locations:
      a. Control and expansion joints on exposed interior surfaces of exterior walls.
      b. Tile control and expansion joints.
      c. Vertical joints on exposed surfaces of unit masonry walls.
      d. Other joints as indicated on Drawings.
   2. Joint Sealant: Urethane, S, NS, 25, NT.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
   1. Joint Locations:
      a. Control joints on exposed interior surfaces of exterior walls.
      b. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
   1. Joint Locations:
      a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
      b. Tile control and expansion joints where indicated.
      c. Other joints as indicated on Drawings.
   2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes hollow-metal steel doors and frames.

1.03 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.04 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.05 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, and finishes for each type of hollow metal door and frame specified.

B. Shop Drawings: In addition to requirements below, provide a schedule of hollow metal doors and frames using same reference numbers for details and openings as those on Drawings:
   1. Elevations of each door design.
   2. Details of doors, including vertical and horizontal edge details.
   3. Frame details for each frame type, including dimensioned profiles.
   4. Details and locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of anchorages, accessories, joints, and connections.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer.
C. Labels: Each fire rated frame and door shall bear applied label of Underwriters Laboratories (UL), Warnock Hersey International (WHI), or other approved independent testing laboratory and inspection service. Approvals shall not be stamped directly into metal frames or doors.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
   1. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch high, wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber.
   1. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch (space between each stacked door to permit air circulation.

1.08 PROJECT CONDITIONS

A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating hollow metal frames without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Curries Company; ASSA ABLOY.
   2. Hollow Metal Inc.
   4. Republic Doors and Frames.
   5. Steelcraft; an Allegion brand.

2.02 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated on Drawings, based on testing at positive pressure according to NFPA 252 or UL 10C.

B. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.38 deg Btu/F x h x sq. ft. when tested according to ASTM C 518.
2.03 INTERIOR STANDARD STEEL FRAMES

A. Construct steel frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Frames: SDI A250.8, Level 3; SDI A250.4, Level A.
   1. Frames:
      a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
      b. Materials at wet locations: Metallic-coated steel sheet, minimum thickness of 0.053 inch.
      c. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
      d. Construction:
         1) Knocked down: Provide at conditions where existing opening in walls are not changed
         2) Full profile welded: unless conditions require knocked down.
      e. Exposed Finish: Prime.

2.04 EXTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3; SDI A250.4, Level A.
   1. Doors:
      a. Type: As indicated in the Door and Frame Schedule.
      c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
      d. Edge Construction: Model 2, Seamless.
      e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
      f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
      g. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
      h. Core: Vertical steel stiffener with injected polyurethane.
   2. Frames:
      a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
      a) Construction: Full profile welded.

2.05 FRAME ANCHORS

A. Jamb Anchors:
   1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
   2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

C. Material: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
   1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M; hot-dip galvanized according to ASTM A 153/A 153M, Class B.

2.06 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

D. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153/A 153M.

E. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal door frames of type indicated.

F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-developed indexes of 25 and 50 respectively; passing ASTM E 136 for combustion characteristics.

2.07 FABRICATION

A. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
   1. Sidelite Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding, or by rigid mechanical anchors.
   2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
   3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
      a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
      b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

B. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement,
mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

C. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.
   1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
   2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
   3. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
   4. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

2.08 STEEL FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
   1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.01 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.02 INSTALLATION

A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.

B. Hollow-Metal Frames: Comply with SDI A250.11.
   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
b. Install frames with removable stops located on secure side of opening.

2. Fire-Rated Openings: Install frames according to NFPA 80.
3. Floor Anchors: Secure with postinstalled expansion anchors.
4. Solidly pack mineral-fiber insulation inside frames.
5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
   1. Non-Fire-Rated Steel Doors: Comply with SDIA250.8.
   2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.03 CLEANING AND TOUCHUP

A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
1. Solid-core doors rated and non-rated doors with paint grade wood faces.

1.03 SUBMITTALS

A. Product Data: For each type of door indicated.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate fire-protection ratings for fire-rated doors.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.


C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Algoma Hardwoods, Inc.
2. Eggers Industries.
3. Graham; an Assa Abloy Group company.
5. Mohawk Flush Doors, Inc.; a Masonite company.
7. VT Industries Inc.

2.02 DOOR CONSTRUCTION, GENERAL

A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

B. WDMA I.S.1-A Performance Grade:
   1. Heavy Duty unless otherwise indicated.
   2. Extra Heavy Duty: Classrooms and Cross-corridor doors

C. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
   1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
   2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Comply with specified requirements for exposed edges.

D. Mineral-Core Doors:
   1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
   2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
   3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.03 FIVE-PLY FLUSH WOOD DOORS FOR OPAQUE FINISH

A. Architectural Woodwork Standards Grade: Custom

B. Faces: Hardboard or MDF.

C. Hardboard Faces: ANSI A135.4, Class 1 (tempered) or Class 2 (standard).

D. MDF Faces: ANSI A208.2, Grade 150 or Grade 160.

E. Exposed Vertical Edges: Any closed-grain hardwood.
   1. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.
   2. Fire-Rated Pairs of Doors: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
   3. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
         1) Extra Heavy Duty: 550 lbf
         2) Heavy Duty: 475 lbf
F. Core for Non-Fire-Rated Doors: Either glued wood stave or WDMA I.S. 10 structural composite lumber.

G. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.
1. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings as needed to eliminate through-bolting hardware.

H. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.04 LIGHT FRAMES

A. Metal Frames for Light Openings in Doors: Manufacturer's standard frame formed of 0.048-inch- (1.2-mm-) thick, cold-rolled steel sheet; factory primed for paint finish; and approved for use in doors of fire-protection rating indicated.

2.05 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
1. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied.

C. Openings: Cut and trim openings through doors in factory.
1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."

PART 3 - EXECUTION

3.01 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Finish Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.
   a. Comply with NFPA 80 for fire-rated doors.
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, all of the Contract Documents, including General Conditions, and Division 1 General Requirements, apply to the work of this Section.

1.02 SUMMARY

A. The work of this Section includes the rolling counter door at the Kitchen tray return opening to the Dishwash room.

B. Related Sections: Other specification sections which directly relate to the work of this Section include, but are not limited to, the following:

1. Section 08 71 00 – Door Hardware; key cylinders for locks.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer’s product data and installation instructions for each type of rolling counter door. Include both published data and any specific data prepared for this project.

B. Shop Drawings: Submit shop drawings for approval prior to fabrication. Include detailed plans, elevations, details of framing members, required clearances, anchors, and accessories. Include relationship with adjacent materials.

1.04 QUALITY ASSURANCE

A. Manufacturer: Rolling counter doors shall be manufactured by a firm with a minimum of five years’ experience in the fabrication and installation of rolling counter doors. Manufacturers proposed for use, which are not named in these specifications, shall submit evidence of ability to meet performance and fabrication requirements specified, and include a list of five projects of similar design and complexity completed within the past five years.

B. Installer: Installation of rolling counter doors shall be performed by an authorized representative of the manufacturer.

C. Single-Source Responsibility: Provide doors, guides, motors, and related primary components from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.
D. Pre-Installation Conference: Schedule and convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in labeled protective packages. Store and handle in strict compliance with manufacturer’s instructions and recommendations. Protect from damage form weather, excessive temperatures and construction operations.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Cornell Iron Works, in Mountaintop, Pennsylvania; Telephone 800-233-8366; (design standard).

B. Overhead Door Corporation, Pennsylvania Division; Telephone 800-929-2553 or 717-248-0131.

C. Overhead Door of Washington, DC, Beltsville, Maryland; Telephone 301-937-1800.

D. Or approved equal.

2.02 ROLLING COUNTER DOORS

A. Manufacturer:
   3. Pre-bid approved equal in accordance with Section 01 25 00.

B. Curtain to consist of #1F interlocked flat-faced slats, ½” deep of 22 gauge stainless steel. Molded high-strength nylon endlocks riveted to ends of alternate slats. Bottom bar to be extruded aluminum tubular section with continuous lift handle and vinyl astragal.

C. Guides to be stainless steel formed guides, 12 gauge, equipped with polypropylene pile runners and snap-on trim to cover fasteners. Attached guides to jambs with ¼” bolts, spaced not more than 12” apart.

D. Counterbalance shaft assembly shall consist of steel pipe capable of supporting curtain load with maximum deflection of 0.03” per foot of width and helical torsion spring assembly designed for proper balance of door to insure that effort to operate door will not exceed 15 pounds. Provide wheel for applying spring torque and for future adjustment.

E. Brackets shall be reinforced steel plate to support counterbalance assembly, form end closures and provide mounting surface for securing ends of hood.

F. Hood shall be 24 gauge stainless steel. Intermediate supports shall be provided as required to prevent excessive sag.

G. Operation shall be manual push-up.
H. Equip doors with latching by slide bolts suitable for use with two point dead locks with mortise cylinders operable from Cafeteria side.

I. Wall Mounting Condition: Face-of-wall mounting.

2.03 FINISHES

A. Exposed stainless steel shall be #4 finish.

PART 3 - EXECUTION

3.01 PREPARATION

A. Take field dimensions and examine conditions of substrates, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Strictly comply with manufacturer’s installation instructions and recommendations. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.

B. Instruct Owner’s personnel in proper operating procedures and maintenance schedule.

3.03 ADJUSTING AND CLEANING

A. Test roll counter doors for proper operation and adjust as necessary to provide proper operation without binding or distortion.

B. Touch-up damaged coatings and finishes and repair minor damage in a manner acceptable to Owner’s representative and Architect. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer of material or product being cleaned.

END OF SECTION
PART 1 – GENERAL (PEA, format as standard)

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Overhead Upcoiling Security Grilles, manually operated.

1.3 RELATED SECTIONS

A. Section 08710 - Door Hardware: Product Requirements for cylinder core and keys.

1.4 REFERENCES

A. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM A 666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.


1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
C. Shop Drawings: Include detailed plans, elevations, details of framing members, required clearances, anchors, and accessories. Include relationship with adjacent materials.

D. Samples: Provide a complete set of color chips representing manufacturer's full range of available colors and patterns.

E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years’ experience in the fabrication and installation of security closures.

B. Installer Qualifications: Company specializing in performing Work of this section with minimum three years and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.

C. Store materials in a dry, warm, ventilated weathertight location.

1.8 COORDINATION

A. Coordinate Work with other operations and installation of adjacent finish materials to avoid damage to installed materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: info@overheaddoor.com.
B. Requests for substitutions will be considered in accordance with provisions of Section 01 25 00.

2.2 UPCOILING SECURITY GRILLES

A. Overhead Coiling Aluminum Grilles: Overhead Door Corporation Model 674 for interior applications only.
   1. Curtain: Aluminum frame surrounding and capturing .062" (1.57 mm) thick perforated aluminum panels. Perforations shall be 3/16" (4.76 mm) diameter; holes are spaced 7/32" (5.56 mm) apart.
   2. Finish:
      a. PowderGuard Premium: Weather resistant polyester powder coat color as selected by the Architect.
      b. Prime all non-galvanized, exposed ferrous surfaces with black powder coat finish.
   3. Bottom Bar:
      a. Extruded aluminum, clear anodized.
   4. Guides:
      a. Extruded aluminum shapes with retainer grooves and continuous silicone treated wool-pile strips or PVC inserts to reduce noise and assist operation.
      b. Guides face mounted on adjacent construction.
   5. Brackets: Minimum 3/16 inch (4.8 mm) steel to support barrel, counterbalance and hood as applicable.
   6. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with maximum deflection of 0.03 inches per foot of span. Counterbalance adjustable by means of an adjusting tension wheel.
   7. Hood:
      a. Primed steel, 24 gauge (6 mm).
   8. Manual Operation:
      a. Chain hoist.
   9. Locking:
      a. Center locking bottom bar, secures grille with 1/2" diameter steel throw rods.
         1) Cylinder locks both sides.
      b. Small format interchangeable core.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify opening sizes, tolerances and conditions are acceptable.
B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

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 in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900.

F. Install perimeter trim and closures.

3.4 ADJUSTING

A. Test security grilles for proper operation and adjust as necessary to provide proper operation without binding or distortion.

B. Adjust hardware and operating assemblies for smooth and noiseless operation.

3.5 CLEANING

A. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.

B. Remove labels and visible markings.
C. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 PROTECTION

A. Protect installed products until completion of project.
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes:
   1. Mechanical and electrified door hardware for:
      a. Swinging doors.
   2. Electronic access control system components, including:
      a. Electronic access control devices.

B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:
   1. Windows
   2. Cabinets (casework), including locks in cabinets
   3. Signage
   4. Toilet accessories
   5. Overhead doors

C. Related Sections:
   1. Division 01 Section “Alternates” for alternates affecting this section.
   2. Division 07 Section “Joint Sealants” for sealant requirements applicable to threshold installation specified in this section.
   3. Division 26 sections for connections to electrical power system and for low-voltage wiring.
   4. Division 28 sections for coordination with other components of electronic access control system.

1.03 REFERENCES

A. UL - Underwriters Laboratories
   1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute
   1. Sequence and Format for the Hardware Schedule
   2. Recommended Locations for Builders Hardware
   3. Key Systems and Nomenclature

C. ANSI - American National Standards Institute
   1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties

1.04 SUBMITTALS

A. General:
   1. Submit in accordance with Conditions of Contract and Division 01 requirements.
   2. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
   3. Prior to forwarding submittal, comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, “EXAMINATION” article, herein.

B. Action Submittals:
   1. Product Data: Product data including manufacturers’ technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
   2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
      a. Wiring Diagrams: For power, signal, and control wiring and including:
         1) Details of interface of electrified door hardware and building safety and security systems.
         2) Schematic diagram of systems that interface with electrified door hardware.
         3) Point-to-point wiring.
         4) Risers.
   3. Samples for Verification: If requested by Architect, submit production sample or sample installations of each type of exposed hardware unit in finish indicated, and tagged with full description for coordination with schedule.
a. Samples will be returned to supplier in like-new condition. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:

a. Door Index; include door number, heading number, and Architects hardware set number.
b. Opening Lock Function Spreadsheet: List locking device and function for each opening.
c. Type, style, function, size, and finish of each hardware item.
d. Name and manufacturer of each item.
e. Fastenings and other pertinent information.
f. Location of each hardware set cross-referenced to indications on Drawings.
g. Explanation of all abbreviations, symbols, and codes contained in schedule.
h. Mounting locations for hardware.
i. Door and frame sizes and materials.
j. Name and phone number for local manufacturer's representative for each product.
k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components). Operational description should include how door will operate on egress, ingress, and fire and smoke alarm connection.
   1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.

5. Key Schedule:

a. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
b. Use ANSI/BHMA A156.28 “Recommended Practices for Keying Systems” as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.
   1) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.

f. Prepare key schedule by or under supervision of supplier, detailing Owner’s final keying instructions for locks.

6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory prepared for door hardware installation.

C. Informational Submittals:

1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.

2. Product Certificates for electrified door hardware, signed by manufacturer:
   a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.

3. Certificates of Compliance:
   a. Certificates of compliance for fire-rated hardware and installation instructions if requested by Architect or Authority Having Jurisdiction.
   b. Installer Training Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer training meeting specified in “QUALITY ASSURANCE” article, herein.
   c. Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in “QUALITY ASSURANCE” article, herein.

4. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by qualified testing agency, for door hardware on doors located in accessible routes.

5. Warranty: Special warranty specified in this Section.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
   a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
   b. Catalog pages for each product.
   c. Name, address, and phone number of local representative for each manufacturer.
   d. Parts list for each product.
e. Final approved hardware schedule, edited to reflect conditions as-installed.
f. Final keying schedule
g. Copies of floor plans with keying nomenclature
h. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
i. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

1.05 QUALITY ASSURANCE

A. Product Substitutions: Comply with product requirements stated in Division 01 and as specified herein.

1. Where specific manufacturer’s product is named and accompanied by “No Substitute,” including make or model number or other designation, provide product specified. (Note: Certain products have been selected for their unique characteristics and particular project suitability.)
   a. Where no additional products or manufacturers are listed in product category, requirements for “No Substitute” govern product selection.

2. Where products indicate “acceptable manufacturers” or “acceptable manufacturers and products”, provide product from specified manufacturers, subject to compliance with specified requirements and “Single Source Responsibility” requirements stated herein.

B. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.

1. Warehousing Facilities: In Project's vicinity.
2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
4. Coordination Responsibility: Coordinate installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.
   a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.

C. Installer Qualifications: Qualified tradesmen, skilled in application of commercial grade hardware with record of successful in-service performance
for installing door hardware similar in quantity, type, and quality to that indicated for this Project.

D. Architectural Hardware Consultant Qualifications: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:

1. Can provide installation and technical data to Architect and other related subcontractors.
2. Can inspect and verify components are in working order upon completion of installation.
3. Capable of producing wiring diagrams.
4. Capable of coordinating installation of electrified hardware with Architect and electrical engineers.

E. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.
2. Manufacturers that perform electrical modifications and that are listed by testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

F. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

G. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

H. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

I. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release latch. Locks do not require use of key, tool, or special knowledge for operation.
J. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in “REFERENCES” article, herein.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of wrist and that operate with force of not more than 5 lbf (22.2 N).
2. Maximum opening-force requirements:
   a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
   b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
   c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
3. Bevel raised thresholds with slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
4. Adjust door closer sweep periods so that, from open position of 70 degrees, door will take at least 3 seconds to move to 3 inches (75 mm) from latch, measured to leading edge of door.

K. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01.

2. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
   a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
   b. Preliminary key system schematic diagram.
   c. Requirements for key control system.
   d. Requirements for access control.
   e. Address for delivery of keys.

L. Pre-installation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Inspect and discuss preparatory work performed by other trades.
3. Inspect and discuss electrical roughing-in for electrified door hardware.
4. Review sequence of operation for each type of electrified door hardware.
5. Review required testing, inspecting, and certifying procedures.

M. Coordination Conferences:

1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.
2. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

1. Deliver each article of hardware in manufacturer’s original packaging.

C. Project Conditions:

1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
2. Provide secure lock-up for door hardware delivered to Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

D. Protection and Damage:

1. Promptly replace products damaged during shipping.
2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

F. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.07 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

E. Direct shipments not permitted, unless approved by Contractor.

1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Years from date of Substantial Completion, for durations indicated.

a. Closers:
   1) Mechanical: 25 years.

b. Exit Devices:
   1) Mechanical: 3 years.
   2) Electrified: 1 year.

c. Locksets:
   1) Mechanical: 3 years.
   2) Electrified: 1 year.

d. Continuous Hinges: Lifetime warranty.

e. Key Blanks: Lifetime

2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

1.09 MAINTENANCE

A. Maintenance Tools:

1. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The Owner requires use of certain products for their unique characteristics and particular project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product
offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: “No Substitute.”

1. Where “No Substitute” is noted, submittals and substitution requests for other products will not be considered.

B. Approval of manufacturers and/or products other than those listed as “Scheduled Manufacturer” or “Acceptable Manufacturers” in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.

C. Approval of products from manufacturers indicated in “Acceptable Manufacturers” is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer’s product.

D. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

E. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fasteners

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
4. Install hardware with fasteners provided by hardware manufacturer.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Ives 5BB series
2. Acceptable Manufacturers and Products: Bommer BB series, Stanley FBB Series

B. Requirements:
1. Provide five-knuckle, ball bearing hinges conforming to ANSI/BHMA A156.1.

2. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
   a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
   b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

3. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
   a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

4. 2 inches or thicker doors:
   a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

5. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.

6. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.

7. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Out-Swinging Interior Lockable Doors: Non-removable pins
   e. Interior Non-lockable Doors: Non-rising pins

8. Width of hinges: 4-1/2 inches (114 mm) at 1-3/4 inch (44 mm) thick doors, and 5 inches (127 mm) at 2 inches (51 mm) or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.

9. Doors 36 inches (914 mm) wide or less furnish hinges 4-1/2 inches (114 mm) high; doors greater than 36 inches (914 mm) wide furnish hinges 5 inches (127 mm) high, heavy weight or standard weight as specified.

10. Provide hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component.

11. Provide mortar guard for each electrified hinge specified.

12. Provide spring hinges where specified. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches (2286 mm) or less in height. Provide one additional bearing hinge for each 30 inches (762 mm) of additional door height.
2.04 CONTINUOUS HINGES

A. Aluminum Geared

1. Manufacturers:

   a. Scheduled Manufacturer: Ives.

2. Requirements:

   a. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
   b. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum, with 0.25-inch (6 mm) diameter Teflon coated stainless steel hinge pin.
   c. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
   d. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
   e. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
   f. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
   g. Install hinges with fasteners supplied by manufacturer.
   h. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.05 ELECTRIC POWER TRANSFER

A. Manufacturers:

   a. Scheduled Manufacturer: Von Duprin EPT-10
   b. Acceptable Manufacturers: No substitute.

B. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires sufficient to accommodate electric function of specified hardware.

C. Locate electric power transfer per manufacturer’s template and UL requirements, unless interference with operation of door or other hardware items.

2.06 FLUSH BOLTS

A. Manufacturers:

   1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Burns, Trimco

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.07 COORDINATORS

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Burns, Trimco

B. Requirements:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers and surface vertical rod exit device strikes. Factory-prep coordinators for vertical rod devices if required.

2.08 CYLINDRICAL LOCKS – GRADE 2

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage AL Series

B. Requirements

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 2. Cylinders: Refer to “KEYING” article, herein.
2. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch (13 mm) latch throw. Provide 2-3/8 inches (60 mm) backset where noted of if door or frame detail requires. Provide proper latch throw for UL listing at pairs.
3. Provide locksets with separate anti-rotation through bolts, and no exposed screws. Provide levers that operate independently, and have two external return spring cassettes mounted under roses to prevent lever sag.
4. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
5. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.
   b. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

2.09 EXIT DEVICES

A. Manufacturer and Product:
   1. Scheduled Manufacturer: Von Duprin 98/35A series.

B. Requirements:
   1. Provide exit devices tested to ANSI/BHMA A156.3-2014 Grade 1, UL certified to meet maximum 5 pound requirements according to the California Building Code section 11B-309.4[,] and UL listed for Panic Exit or Fire Exit Hardware. Cylinders: Refer to “KEYING” article, herein.
   2. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
   3. Quiet Operation: Incorporate fluid damper or other device that eliminates noise of exit device operation.
   4. Touchpad: Extend minimum of one half of door width, but not the full length of exit device rail. Provide end-cap with two-point attachment to door. Match exit device finish, stainless steel for US26, US26D, US28, US32, and US32D finishes; and for all other finishes, provide compatible finish to exit device. Provide compression springs in devices, latches, and outside trims or controls; tension springs prohibited.
   5. Provide rim devices with a dual cylinder or inside thumb turn cylinder option with a visual security indicator that identifies the trims locked/unlocked status of the door from the inside of the room. Indicator in unlocked state presents a 1/2 inch x 1/2 inch white metal flag with black icon at top of device head. Indicator in locked state has no flag present. Provide rim devices without the dual cylinder or inside thumb turn cylinder option capable of being retrofitted with the visual security indicator.
   6. Provide exit devices with dead latching feature for security and for future addition of alarm kits and/or other electrical requirements.
   7. Provide exit devices with manufacturer’s approved strikes.
   8. Provide exit devices cut to door width and height. Locate exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
   9. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
10. Provide cylinder dogging at non-fire-rated exit devices, unless specified less dogging.

11. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion that is removed by use of a keyed cylinder, which is self-locking when re-installed.

12. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.
   a. Lever Style: Match lever style of locksets.
   b. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

13. Provide UL labeled fire exit hardware for fire rated openings.

14. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.

15. Provide electrified options as scheduled in the hardware sets.

2.10 CYLINDERS

A. Manufacturers:
   1. Scheduled Manufacturer: ASSA

B. Requirements:
   1. Provide cylinders/cores to match Owner’s existing ASSA Maximum+ key system, compliant with ANSI/BHMA A156.5; latest revision, Section 12, Grade 1; permanent cylinders; cylinder face finished to match lockset, manufacturer’s series as indicated. Refer to “KEYING” article, herein.
   2. Replaceable Construction Cores.
      a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
         1) 3 construction control keys
         2) 12 construction change (day) keys.
      b. Owner or Owner’s Representative will replace temporary construction cores with permanent cores.

2.11 KEYING

A. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:
1. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
   a. Master Keying system as directed by the Owner.

2. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements shall be cause for replacement of cylinders/cores involved at no additional cost to Owner.

3. Quantity: Furnish in the following quantities.
   a. Change (Day) Keys: 3 per cylinder/core.
   b. Permanent Control Keys: 3.

2.12 DOOR CLOSERS

A. Manufacturers and Products:


B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2 inch (38 mm) diameter with 3/4 inch (19 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged firearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.
2.13 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: LCN 1450 series
2. Acceptable Manufacturers and Products: No Substitute

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory.
2. Provide door closers with fully hydraulic, full rack and pinion action with cast aluminum cylinder.
3. Closer Body: 1-1/4 inch (32 mm) diameter, with 5/8 inch (16 mm) diameter heat-treated pinion journal and full complement bearings.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and back check.
7. Pressure Relief Valve (PRV) Technology: not permitted.
8. Provide stick on and special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.14 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Burns, Trimco

B. Requirements:

1. Provide push plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick and beveled 4 edges. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
2. Provide push bars of solid bar stock, diameter and length as scheduled. Provide push bars of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.
3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
4. Provide flush pulls as scheduled. Where required, provide back-to-back mounted model.
5. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
6. Provide pull plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.

7. Provide wire pulls of solid bar stock, diameter and length as scheduled.

8. Provide decorative pulls as scheduled. Where required, mount back to back with pull.

2.15 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Burns, Trimco

B. Requirements:

1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes of plates:
   a. Kick Plates: 10 inches (254 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
   b. Mop Plates: 4 inches (102 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
   c. Armor Plates: 36 inches (914 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs

2.16 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers: Glynn-Johnson
2. Acceptable Manufacturers: Rixson, ABH

B. Requirements:

1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.
3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

2.17 DOOR STOPS AND HOLDERS

A. Manufacturers:
   1. Scheduled Manufacturer: Ives
   2. Acceptable Manufacturers: Burns, Trimco

B. Provide door stops at each door leaf:
   1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
   2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
   3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

2.18 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:
   1. Scheduled Manufacturer: Zero International
   2. Acceptable Manufacturers: National Guard, Reese

B. Requirements:
   1. Provide thresholds, weather-stripping (including door sweeps, seals, and astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
   2. Size of thresholds:
      a. Saddle Thresholds: 1/2 inch (13 mm) high by jamb width by door width
      b. Bumper Seal Thresholds: 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width
   3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

2.19 SILENCERS

A. Manufacturers:
   1. Scheduled Manufacturer: Ives
   2. Acceptable Manufacturers: Burns, Trimco
B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.20 MAGNETIC HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: LCN
2. Acceptable Manufacturers: Rixson, ABH

B. Requirements:

1. Provide wall or floor mounted electromagnetic door release as specified with minimum of 25 pounds of holding force. Coordinate projection of holder and armature with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Connect magnetic holders on fire-rated doors into the fire control panel for fail-safe operation.

2.21 MAGNETIC CATCHES

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Engineered Products Company,

B. Requirements:

1. Provide magnetic catches with self-aligning magnets that can be surface mounted or mortised.
2. Provide magnetic catches in an aluminum case 1 inch wide x 3-1/8 inch long. Provide dual triple pole (Ives 327), where scheduled, with 14 pound load capacity, and dual double pole catches (Ives 326), where scheduled, with 9 pound load capacity.

2.22 DOOR POSITION SWITCHES

A. Manufacturers:

1. Scheduled Manufacturer: Schlage
2. Acceptable Manufacturers: Interlogix, SDC

B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

2.23 FINISHES

A. Finish: BHMA 626/652 (US26D); except:
   1. Hinges at Exterior Doors: BHMA 630 (US32D)
   2. Continuous Hinges: BHMA 628 (US28)
   4. Protection Plates: BHMA 630 (US32D)
   5. Overhead Stops and Holders: BHMA 630 (US32D)
   6. Door Closers: Powder Coat to Match
   7. Wall Stops: BHMA 630 (US32D)
   8. Weatherstripping: Clear Anodized Aluminum
   9. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Existing Door and Frame Compatibility: Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.

C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

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

3.02 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
   2. Custom Steel Doors and Frames: HMMA 831.
B. Install each hardware item in compliance with manufacturer’s instructions and recommendations, using only fasteners provided by manufacturer.

C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

H. Lock Cylinders: Install construction cores to secure building and areas during construction period.
   1. Replace construction cores with permanent cores as indicated in keying section.

I. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.

J. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
   1. Configuration: Provide least number of power supplies required to adequately serve doors with electrified door hardware.

K. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

L. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

M. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

N. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
3.03 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.04 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DEMONSTRATION

A. Provide training for Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.06 DOOR HARDWARE SCHEDULE

A. Locksets, exit devices, and other hardware items are referenced in the following hardware sets for series, type and function. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.

B. Hardware Sets:
Hardware Group No. 100

DOORS:

T-2

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DOORS NORMALLY CLOSED AND SECURE
FREE EGRESS AT ALL TIMES
ENTRY BY VALID CREDENTIAL OR ACCESS CONTROL TIME ZONE OR KEY OVERRIDE OR REMOTE RELEASE
UPON LOSS OF POWER DOORS REMAIN LOCKED
DOOR POSITION MONITORED

Hardware Group No. 101

DOORS:

U

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Hardware Group No. 201

DOORS:
161A-2  161A-3  161A-4  Dishwash Room: Tray Return Rolling Counter Door

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ACPS: JOHN ADAMS ES KITCHEN RENOVATION  DOOR HARDWARE
Alexandria, Virginia  08 71 00 - 28
PE Project 72641.00.0  November 4, 2019
HWSET # 703

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HARDWARE SET NO. 801

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END OF SECTION 08 71 00
PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Float glass.
   2. Clear tempered glass.
   3. Coated glass.
   4. Insulating glass units.
   5. Fire-rated glazing.

1.03 QUALITY ASSURANCE

A. Standards: Comply with applicable provisions and recommendations of:
   1. GANA Publications: GANA's "Glazing Manual."

B. Manufacturer's Qualifications: Provide glazing systems produced by a single manufacturer with not less than 5 years successful experience in the fabrication of assemblies of the type and quality required.

C. Installer's Qualifications: Interior glazed systems shall be installed by a firm that has not less than 5-years successful experience in the installation of systems similar to those required.

1.04 ACTION SUBMITTALS

A. Samples: Submit 12 inch square samples of each glass product. Submit 6 inch long samples of glazing sealant and glazing tape, for color review.

B. Manufacturer's Data: Submit manufacturers' technical data and instructions for installing and maintaining each glazing material.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturers of insulating-glass units with sputter-coated, low-e coatings.
B. Product Certificates: For glass and glazing products, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for glazing sealants.
   1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

D. Preconstruction adhesion and compatibility test report.

E. Warranties: Sample of special warranties.

1.06 DELIVERY, STORAGE AND HANDLING

A. Protect glazing materials and according to manufacturer's written instructions and as needed to prevent damage to glass, glazing and plastic wall panels materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.07 EXTENDED WARRANTIES

A. General: Submit warranties signed by the respective manufacturers agreeing to repair or replace defective materials or workmanship within the specified warranty periods, starting from the date of substantial completion.
   1. Insulating Glass Units: Submit a ten (10) year warranty against defects of each of the insulating glass unit types specified, from manufacturer.
      a. Defects include but are not limited to loss of seal, interior clouding, discoloration, and other imperfections.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Glazing Manufacturers and Fabricators: Subject to compliance with requirements, firms producing glass products which may be incorporated into the work include the following:
   1. AGC Glass Company North America, Inc.
   2. Guardian Glass; SunGuard.
   3. J.E. Berkowitz, LP.
   4. Oldcastle BuildingEnvelope™.
   5. Pilkington North America.
   6. PPG Industries, Inc.
   7. Viraco, Inc.
   8. Vitro Architectural Glass.

B. Fire-Rated Glazing Manufacturers: Subject to compliance with requirements, firms producing fire-rated glazing products which may be incorporated into the work include the following:
   1. Technical Glass Products, Inc.
   2. Sañí First.
   3. Schott North America, Inc.

2.02 GLASS, GENERAL

A. Primary Glass Standard: Provide primary glass which complies with ASTM C 1036 requirements for type, class and quality.
B. Heat-Treated Glass Standard: Provide heat-treated glass which complies with ASTM C 1048 requirements. Surface compression of heat strengthened glass shall be in the range of 3500 to 6500 psi.
   1. Provide heat treated glass where glass would be vulnerable to thermal breakage and where required for safety of persons.
   2. Provide fully tempered or heat strengthened glass where indicated or required by authorities having jurisdiction.
   3. Tempered glass shall comply with ANSI Z97.1.

C. Sizes: Fabricate glass to sizes required, with edge clearances and tolerances complying with recommendations of glass manufacturer. Provide thicknesses to comply with Building Code, and as recommended by glass manufacturer, unless greater thickness is indicated.

2.03 PRIMARY GLASS
   A. Clear Float Glass: Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), ¼ inches (6.4 mm) thick.

2.04 HEAT-TREATED GLASS
   A. Tempered Glass: Provide fully tempered glass only where safety glass is mandatory or where design pressures are beyond the capacity of heat strengthened glass. Tempered glass shall be free from inclusions.
      1. Provide 1/4-inch (6.4 mm) thick tempered glass where indicated on drawings.

2.05 COATED GLASS
   A. Low-Emittance Coated Vision Glass: ASTM C 1376, coated by vacuum deposition (sputter-coating) process, and complying with other requirements specified.
      1. Kind: Kind CV (coated vision glass).
      2. Glass: Clear float.
      3. Visible Light Transmittance: 54 percent minimum.

2.06 INSULATING-GLASS UNITS
   A. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units.
      1. Provide Low-E vacuum deposition-coated glass with coating on surface 2 or 3.
      2. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
      3. Provide Kind FT (fully tempered) glass lites where safety glass is indicated and as required by code.
      4. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
      5. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
      6. Spacer: Manufacturer's standard spacer material and construction.
         a. Desiccant: Molecular sieve or silica gel, or blend of both.
      7. Insulated Unit: 1 inch overall thickness
a. Outboard Lite: ¼ inch Clear; Heat-Strengthened or Fully Tempered as required by regulations.
   1) Low E Coating on Surface #2
b. Airspace: ½ inch thickness
c. Sealant: Black Silicone
d. Inboard Lite: 1/3 inch Clear; Annealed, Heat-Strengthened or Fully tempered as required by regulations.

B. U-Factor: 0.35 Btu/sq. ft. x h x deg F or less.

C. Solar Heat-Gain Coefficient (SHGC): Provide maximum of 0.30, determined according to NFRC 200 procedures.

2.07 FIRE-RATED GLAZING MATERIALS

A. Basis of Design: Pyrostop as manufactured by the Pilkington Group and distributed by Technical Glass Products, or equivalent products of one of the specified manufacturers.

B. Composition: Composed of multiple sheets of “Optiwhite” high visible light transmission glass laminated with an intumescent interlayer.

C. Properties:
   1. Thickness: For Interior Use: As required for fire rating specified.
   2. Fire-rating: 20 minute and 45 minute.

D. Permanently label each piece of glazing with the appropriate marking for rating.

E. Fire Rating: Fire rating listed and labeled by UL for fire rating scheduled at opening locations on drawings, when tested in accordance with ASTM E 119 and UL 263.

2.08 GLAZING MATERIALS

A. General: Provide standard color of glazing materials as selected by Architect. Comply with manufacturer's recommendations for applications and conditions at time of installation.

B. Polyurethane Glazing Gasket: Polyurethane gasket or stick tape, color to be selected by Architect, thickness and size as shown on drawings.

C. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

D. Setting Blocks: Neoprene, silicone or EPDM, 70-90 durometer hardness, with proven compatibility with glazing materials used.

E. Spacers: Neoprene, silicone or EPDM, 40-50 durometer hardness with proven compatibility with glazing materials used.

F. Compressible Fillers: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, proven to be compatible with sealants used, flexible and resilient, with 5-10 psi compression strength for 25% deflection.

G. Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
   1. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.
H. Glazing Materials for Fire-Rated Glazing
   1. Glazing Tape: Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to effect an air and vapor seal.
   2. Silicone Sealant: One-part neutral curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50 percent in both extension and compression (total 100 percent); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable. Available Products:
      a. Dow Corning 795 - Dow Corning Corp.
      b. Silglaze-II 2800 - General Electric Co.
      c. Spectrem 2 - Tremco Inc.
   3. Setting Blocks: Hardwood or calcium silicate; glass width by 4 inches (102-mm) by 3/16 inch (4.7-mm) thick.
   4. Spacers: Neoprene or other resilient blocks of 40 to 50 Shore A durometer hardness, adhesive-backed on one face only, tested for compatibility with specified glazing compound.
   5. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

PART 3 - EXECUTION

3.01 GENERAL
   A. Each glazing installation must withstand normal temperature changes, and impact loading without failure of glass, failure of sealants or gaskets, deterioration of glazing materials and other defects in the work.
   B. Protect glass from damage during handling and installation, and subsequent operation of glazed components of the work. Discard units with edge damage or other imperfections.
   C. Glazing channel dimensions are intended to provide for necessary bite on glass, minimum edge clearance, and adequate tape or sealant thicknesses, with reasonable tolerances.
   D. Comply with recommendations by manufacturers of glass and glazing products, except where more stringent requirements are indicated, including those of referenced glazing standards.

3.02 PREPARATION
   A. Clean glazing channel and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrate.
   B. Where sealants are used, apply primer or sealant to joint surfaces where recommended by sealant manufacturer.

3.03 GLAZING
   A. Where indicated, provide spacers for size and spacing required for glass sizes larger than 50 united inches, except where gaskets or pre-shimmed tapes are used for glazing. Provide 1/4 inch minimum bite of spacer on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.
   B. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.
C. Where sealants are used at butt joints, apply sealant in thin continuous clear bead. Tool sealant to a uniform, continuous, even profile.

3.04 PROTECTION AND CLEANING

A. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

B. Wash and polish glass on both faces not more than 4 days prior to date scheduled for inspections intended to establish Date of Substantial Completion in each area of project. Comply with glass manufacturer's recommendations for final cleaning.

3.05 SCHEDULE OF GLAZING

A. Provide glazing as indicated on Drawings. Where no glazing type is scheduled provide glazing as indicated for similar locations.
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Interior gypsum wallboard and ceiling board with applied finishes.
   2. Non-load-bearing steel framing for gypsum board walls and ceilings.
      a. Sheet steel backing plates for equipment and accessories.
   3. Steel suspended ceiling framing.
   4. Sound attenuation.
   5. Labeling of fire- and smoke-separation partitions.

1.03 DEFINITIONS

A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.04 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal framing capable of withstanding design loads within limits and under conditions indicated.
   1. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
      a. Interior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:
   1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.

1.06 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

B. Mold Resistance: Provide materials tested according to ASTM D3273.

C. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.
   1. STC-Rated Assemblies: Indicated by design designations from GA-600, "Fire Resistance Design Manual."

D. Marking of Framing Members: Provide factory-applied marking and identification on each steel member, including roll-former’s identification, steel thickness in mils or inches exclusive of protective coating, yield strength in ksi, coating weight using standard coating designator, and color-coating as required by Building Code.

E. Gypsum Board Finish Mockups: Before finishing gypsum board assemblies, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and qualities of materials and execution.
   1. Install mockups for the following applications:
      a. Surfaces indicated to receive nontextured paint finishes.
   2. Simulate finished lighting conditions for review of mockups.
   3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Steel Framing and Furring:
      b. MarinoWare; Division of Ware Ind.
      c. Super Stud Building Products, Inc.
   2. Gypsum Board and Related Products:
      a. American Gypsum Co.
      b. Certainteed Corporation.
      c. G-P Gypsum Corp.
2.02 STEEL SUSPENDED CEILING AND SOFFIT FRAMING

A. Components, General: Comply with ASTM C 754 for conditions indicated.

B. Hanger Attachments to Structure: As follows:
   1. Powder-Actuated at Concrete Structure: Suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by a qualified independent testing agency.

C. Hangers: As follows:
   1. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch (4.12-mm) diameter.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch (1.37 mm), a minimum 1/2-inch- (12.7-mm-) wide flange, with ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized zinc coating.
   1. Depth: 1-1/2 inches (38.1 mm).

E. Furring Channels (Furring Members): Commercial-steel sheet with manufacturer's standard corrosion-resistant zinc coating.
   1. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22.2 mm) deep.

F. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
   1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      b. USG Interiors, Inc.; Drywall Suspension System with Firecode fire resistance rating.

G. Custom Framing for Curved Interior Ceilings: Provide custom framing members for curved ceiling surfaces, pre-assembled to the greatest extent possible.

2.03 STEEL PARTITION AND SOFFIT FRAMING

A. Components, General: As follows:
   1. Comply with ASTM C 754 for conditions indicated.
   2. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with manufacturer's standard corrosion-resistant zinc coating.

B. Steel Studs and Runners: ASTM C 645.
   1. Minimum Base Metal Thickness: 0.033 inch (0.84 mm).
   2. Depth: 3-5/8 inches (92.1 mm), unless indicated otherwise.
   3. Where extra height or other special design requires additional strength, provide steel studs of additional thickness.

C. Steel Structural Supports for Partial-Height Walls:
   1. NoFlex, Inc., heavy-gauge steel base plate and tube steel support, fully welded.
   2. Spacing: 48-inches on center.
3. Attachment: Through-bolts into structural floor or blocking below floor.

D. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
   1. Minimum Base Metal Thickness: 0.0312 inch (0.79 mm).
   2. Depth: 7/8 inch (22.2 mm).

E. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Dietrich Metal Framing; The System by Metal-Lite, Inc.
      b. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.

F. Sheet Steel Backing Plates: Galvanized steel sheet, 0.0538-inch (16-gauge) extending to nearest stud beyond each end of device being attached.

G. Custom Framing for Curved Surfaces: Provide custom framing members for curved surfaces, pre-assembled to the greatest extent possible.

H. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

I. Protective Coating for Shaft Wall Framing: ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized, unless otherwise indicated.

2.04 INTERIOR GYPSUM WALLBOARD

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Gypsum Wallboard: ASTM C 1396/C 1396M.
   1. Type X:
      a. Thickness: 5/8 inch, unless noted otherwise
      b. Long Edges: Tapered.
      c. Location: At all gypsum wallboard locations, and where required for fire-resistance-rated assembly, unless noted otherwise.
   2. Moisture- and Mold-Resistant Type X: mold resistance score of 10 as tested in accordance with ASTM D 3273 and water absorption of less than 5-percent by weight as tested in accordance with ASTM C 473
      a. Thickness: 5/8 inch, unless noted otherwise
      b. Long Edges: Tapered.
      c. Location: Vertical surfaces where indicated on Drawings.
      b. Thickness: 5/8 inch, unless noted otherwise
      c. Long Edges: Tapered.
      d. Location: Vertical surfaces where indicated on Drawings.
      e. Exposed face: High Strength Gypsum and cellulose fibers.
      f. Core: Perlite.
g. Unexposed face: Glass fiber-mesh scrim embedded in high strength gypsum & cellulose fibers.

h. ASTM E-136 (non-combustibility)
i. ASTM E-84: Flame Spread 5, Smoke Developed 0 (both faces of panels)
j. ASTM C-1278
k. ASTM D-3273: Mold Resistance
l. Performance properties:
   1) Surface Abrasion: Level 3 Tested in accordance with ASTM C1629
   2) Surface Indentation: Level 1 Tested in accordance with ASTM C1629
   3) Soft-body Impact: Level 3 Tested in accordance with ASTM C1629
   4) Hard-body Impact: Level 2 Tested in accordance with ASTM C1629.

C. Type C: Having improved fire resistance over standard Type X, and complying with requirements of fire-resistance-rated assemblies indicated on Drawings, referred to as “Type C”.
   1. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
   2. Long Edges: Tapered.

2.05 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
   2. Shapes:
      a. Cornerbead: Use at outside corners, unless otherwise indicated.
      b. L-Bead: L-shaped; exposed long leg receives joint compound; use where indicated.
      c. U-Bead: J-shaped; exposed short flange does not receive joint compound; use at exposed panel edges.
      d. F-Reveal: F-shaped reveal; use at transition between gypsum board and other building material such as CMI.

2.06 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:
   1. Interior Gypsum Wallboard: Paper.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
   3. Fill Coat: For second coat, use setting-type, sandable topping compound.
   4. Finish Coat: For third coat, use setting-type, sandable topping compound.
   5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.
2.07 SOUND ATTENUATION

A. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
   1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
   2. Formaldehyde-Free: Provide sound attenuation blankets containing no formaldehyde.

B. Where sound attenuation insulation is indicated, provide blankets in batt or roll form in thicknesses that most closely fill the entire void of the wall, without crushing.

C. Acoustic Sheet Caulking: Lowry's "Electrical Box Pads" resilient, self-adhesive sound sealer.

D. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      a. Acoustical Sealant for Exposed and Concealed Joints:
         1) Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
         2) United States Gypsum Co.; SHEETROCK Acoustical Sealant.
         3) W.W. Henry #313

2.08 RATED CEILING ASSEMBLIES

A. Light Fixture Insulation for Rated Ceiling Assemblies: Thermafiber’s “FixtureShield”, lightweight prefabricated kits designed to cover light fixtures, speakers, HVAC diffusers, and other ceiling penetrations where required by UL fire rating for floor/ceiling and roof/ceiling assemblies.

2.09 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
   1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, Type S-12, unless otherwise indicated.

D. Signs for Posting Partition Ratings: Provide signs in size and with wording as required by code, appropriate for each partition on which sign is affixed.
   2. At Contractor’s option, provide signs as required by code for each partition using contrasting-color spray paint.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLING STEEL FRAMING, GENERAL

A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."

C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.
   1. Isolate ceiling assemblies where they abut or are penetrated by building structure.

D. Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

3.03 INSTALLING STEEL PARTITION AND SOFFIT FRAMING

A. Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board assemblies abut other construction.
   1. Where studs are installed directly against exterior walls, install asphalt-felt isolation strip between studs and wall.

B. Installation Tolerance: Install each steel framing and furring member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by the faces of adjacent framing.

C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
   1. For fire-resistance-rated and STC-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid-structure surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed to support gypsum board closures and to make partitions continuous from floor to underside of solid structure.
      a. Terminate partition framing at suspended ceilings where indicated.

D. Install steel studs and furring at the following spacings:
   1. Single-Layer Construction: 16 inches (406 mm) o.c., unless otherwise indicated.
   2. At interior walls where electrical outlet and switch boxes are indicated to be back-to-back, provide additional studs as required to locate boxes in separate stud spaces on each side of the wall.
E. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.

F. Install backing plates for wall-hung equipment and accessories, using a minimum of 2 screws per stud. Install backing plates for wall cabinets, toilet accessories, bulletin boards, and other equipment to be attached to walls.

G. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
   1. Install two studs at each jamb, unless otherwise indicated.
   2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint.
   3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

H. Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

3.04 APPLYING AND FINISHING PANELS, GENERAL

A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.

B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

D. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

G. Attach gypsum panels to framing provided at openings and cutouts.

H. Form control and expansion joints with space between edges of adjoining gypsum panels.

I. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

J. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

K. STC-Rated Assemblies: Seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant or with acoustic sheet caulking. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings, and sealing each electrical box.

L. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.
   1. Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications.

M. Space fasteners in panels that are tile substrates a maximum of 8 inches (203.2 mm) o.c.

N. Apply signs indicating fire- and smoke-separation rating for each rated partition, located 8-inches above suspended and dropped framed ceilings and at top of wall at unfinished spaces. Place signs at 12-foot intervals horizontally on straight and curved walls, with no fewer than one sign at each turn in each wall. Place signs on both sides of each rated partition.

3.05 PANEL APPLICATION METHODS

A. Single-Layer Application:
   1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
   2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints. Stagger abutting end joints not less than one framing member in alternate courses of board.
   3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

B. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.
3.06 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

3.07 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
   1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
      a. Locations: Ceiling plenum areas, concealed areas, and where indicated.
   2. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for ceramic tile
      a. Locations: Panels that are substrate for tile
   3. Level 3: Embed tape and apply separate first and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.
      a. Locations: Walls in mechanical rooms, storage rooms, janitor closets, electrical and data closets, and other spaces not occupied by building users on a day-to-day basis.
   4. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.
      a. Locations: Walls and ceilings in public areas including classrooms, offices, toilet rooms and other normally occupied locations
      b. Primer and its application to surfaces are specified in other Division 09 Sections.
   5. Level 5: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound over entire surface where indicated. Contractor’s Option: Use “Level 5” gypsum board and follow manufacturer’s installation and finishing instructions to obtain the same finish as described in the referenced standard.
      a. Locations: Walls scheduled to receive applied digital wallcovering
      b. Primer and its application to surfaces are specified in other Division 09 Sections.
PART 1 - GENERAL

1.01 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY
A. This Section includes the following:
   1. Ceramic tile, including porcelain tile.
   2. Stone threshold
   4. Metal transition strips between tile and other floor finishes.

1.03 REFERENCES AND DEFINITIONS
D. ISO 13007-International Standards Organization; classification for Grout and Adhesives.
E. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.
F. Facial Dimension: Actual tile size (minor facial dimension as measured per ASTM C 499).

1.04 PERFORMANCE REQUIREMENTS
A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with slip resistance with a minimum coefficient of friction value of 0.6 as determined by testing identical products per ASTM C 1028.

1.05 SUBMITTALS
A. Product Data: For each type of product indicated.
B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
C. Samples
   1. For Selection: Manufacturer’s physical sample board.
   2. For Verification: Full-size units of each type and composition of tile and for each color and finish selected.
   3. Metal edge strips in 6-inch (150-mm) lengths.

1.06 QUALITY ASSURANCE


B. Source Limitations for Tile: Obtain all tile from one source or producer.
   1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.

C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

D. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:
   1. Waterproofing.
   2. Joint sealants.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store liquid latexes and emulsion adhesives in unopened containers and protected from freezing.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.09 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.
PART 2 - PRODUCTS

2.01 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
   1. Provide tile complying with Standard grade requirements, unless otherwise indicated.


C. ISO 13007; Standards for Ceramic Tiles, Grouts and Adhesives

D. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
   1. As selected by Architect.

E. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

F. Flooring materials shall have a slip resistance coefficient of friction not less than 0.60 tested in accordance with ASTM D 2047.

2.02 CERAMIC PRODUCTS

A. Glazed Ceramic Wall Tile
   2. Surface: Semi-Gloss/Matte.
   3. Module Size: 4 1/2 x 4 1/2 inches.
   4. Nominal Thickness: 1/4 inch
   5. Face: Plain with cushion edges.
   6. Product: Semi-Gloss/Matte Glazed Wall Tile by Daltile, or approved equal.
   7. Color:
      a. Field tile selected from Group/Type 1
      b. Accent tile selected from Group/Type 1 and 2.

B. Glazed Ceramic Tile
   2. Surface: Matte.
   3. Module Size: 12 x 12 inches.
   4. Nominal Thickness: 5/16 inches
   5. Face: Plain with cushion edges.
   6. Product: Volume 1.0, Glazed Porcelain with Stepwise Technology by Daltile
   7. Color:
      a. Field tile selected from Group/Type 1.
   8. Cove Base: 6 by 12 inches
2.03 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
   1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch (12.7 mm) or less, and finish bevel to match face of threshold. Comply with ADA.

B. Stone Thresholds: Free of cracks, seams, and starts impairing their structural integrity or function, and are from a single quarry for each type, variety, color, and quality of stone specified.
   1. Size and Profile: As required to provide transition between finished surface of tile and that of adjacent finished flooring.
   3. Color and Finish: White, honed marble classified Group A per definitions for soundness classification in MIA "Dimension Stone Design Manual IV."

2.04 WATERPROOFING FOR THIN-SET TILE INSTALLATIONS

A. General: Manufacturer's standard product that complies with ANSI A118.10.

B. Unreinforced, Fluid-Applied Product: Liquid-latex rubber, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), in a consistency suitable for trowel application and intended for use as waterproofing.
   1. Products:
      a. Boiardi Products Corporation; Elastiment 324.
      b. Custom Building Products; LevelQuick Waterproofing and Anti-Fracture Membrane.
      c. Jamo Inc.; Waterproof.
      d. MAPEI; “Mapelastic AquaDefense”, Latex-Based Waterproofing and Crack-Isolation Membrane

2.05 SETTING AND GROUTING MATERIALS

A. Manufacturers:
   2. C-Cure.
   3. Custom Building Products.
   4. LATICRETE International Inc.
   5. MAPEI Corporation.
   6. Summitville Tiles, Inc.
   7. TEC Specialty Products Inc.

B. Improved Modified Dry-Set Mortar (Thinset): ANSI A118.15.
   1. Provide prepackaged, dry-mortar mix to which only water must be added at Project site.
   2. For wall applications, provide nonsagging mortar.

C. High-Performance Tile Grout: ANSI A118.7.
   1. Polymer Type: Liquid-latex form for addition to prepackaged dry-grout mix.
2.06 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Floor Sealer: Colorless, slip- and stain-resistant sealer, not affecting color or physical properties of stone surfaces as recommended by stone tile producers for application indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Bostik Findley.
      b. Custom Building Products.
      c. Hillyard, Inc.
      d. HMK Stone Care System.
      e. Summitville Tiles, Inc.

C. Grout Sealer: Manufacturer's standard product for sealing grout joints that does not change color or appearance of grout.
   1. Products:
      b. Acri-Soy Grout Sealer.
      d. Green Building Supply, GBS Penetrating Sealer.
      e. Homax Products, Inc., Tile Guard Silicone Grout Sealer.
      g. Bostik; CeramaSeal Grout Sealer.
      h. C-Cure; Penetrating Sealer 978.
      i. Custom Building Products; Surfaceguard Sealer.
      j. Jamo Inc.; Penetrating Sealer.
      k. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.
      m. TEC Specialty Products Inc.; TA-256 Penetrating Silicone Grout Sealer.

2.07 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers’ written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.

2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.

3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

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

3.02 PREPARATION

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Provide concrete substrates for tile floors installed with thin-set mortar that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.

1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.

2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.03 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.


C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Jointing Pattern: Lay tile in running bond pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
F. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   1. Locate joints in tile surfaces directly above joints in concrete substrates.

G. Grout tile to comply with requirements of ANSI A108.10, unless otherwise indicated.
   1. For chemical-resistant epoxy grouts, comply with ANSI A108.6.

H. At showers and where indicated, install cementitious backer units and treat joints to comply with ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.04 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.

B. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.05 FLOOR TILE INSTALLATION

A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCNA installation methods and ANSI A108 Series of tile installation standards.
   1. For installations of tile floors composed of tiles 8 by 8 inches (200 by 200 mm) or larger, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.

B. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
   1. Ceramic Tile: 3/16 inch

C. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.

3.06 WALL TILE INSTALLATIONS

A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedules, including those referencing TCNA installation methods and ANSI setting-bed standards.

B. Joint Widths: Install tile on walls with a joint width of 1/16 inch

3.07 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
   1. Remove grout residue from tile as soon as possible.
   2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Apply sealer to cleaned stone tile flooring, according to sealer manufacturer's written instructions.

E. Grout Sealer: Apply grout sealer to grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

F. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

3.08 FLOOR TILE INSTALLATION SCHEDULE

A. Ceramic Tile Installation: TCNA F122; thinset mortar on waterproof membrane.
   1. Ceramic Tile Type: Glazed Ceramic Floor Tile.
   2. Thinset Mortar: Improved modified dry-set mortar.

3.09 WALL TILE INSTALLATION SCHEDULE

A. Ceramic Tile Installation: TCNA W243; thinset mortar on gypsum board.
   1. Ceramic Tile Type: Glazed Ceramic Tile.
   2. Thinset Mortar: Improved modified dry-set mortar.

B. Ceramic Tile Installation: TCNA X###; thinset mortar on concrete masonry unit.
   1. Ceramic Tile Type: Glazed Ceramic Tile.
   2. Thinset Mortar: Improved modified dry-set mortar.

END 09 30 00
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes ceilings consisting of acoustical panels and exposed suspension systems.

B. Work of this Section shall also include patching and repairs, and where required, replacement of existing acoustical panel ceilings damaged or otherwise required to be replaced, due to the Work of this Contract.

1.03 SUBMITTALS

A. Product Data: For each type of product specified.

B. Samples for Verification: Each type of ceiling assembly indicated; in sets for color, texture, and pattern specified, showing the full range of variations expected in these characteristics.
   1. Samples of each acoustical panel type, pattern, and color.
   2. Set of 12-inch-long samples of exposed suspension system members, including moldings, for color and system type required.

C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Product Test Reports: Indicate compliance of acoustical panel ceilings and components with requirements based on comprehensive testing of current products.

E. Research/Evaluation Reports: Evidence of acoustical panel ceiling's and components' compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

F. UL Design: Provide documentation for corresponding UL rated floor/ceiling assembly.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.
C. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
   1. Surface-burning characteristics of acoustical panels comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.07 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, and partition assemblies.

1.08 MAINTENANCE MATERIALS

A. Furnish materials described below that match products installed, packaged with protective covering for storage and identified with labels describing contents.
   1. Acoustical Ceiling Units: Full-size units equal to 2.0 percent of each type amount installed.
   2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.01 ACOUSTICAL PANELS

A. Acoustical Panel Standard: Provide manufacturer's standard size panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, fire ratings, and light reflectance, unless otherwise indicated.

B. Manufacturers:
   1. USG Interiors, Inc.
   2. Armstrong World Industries, Inc.
C. Standard Acoustical Panels (ACT-1): Water-felted, mineral base acoustical panels with fine fissured, medium texture. Provide acoustical panels complying with the following:
   1. Product: “USG Fissured Basic Panels” Item 585, non-sag type as manufactured by USG Interiors, Inc. Other acceptable product is “School Zone Fine Fissured” Item 1810, non-sag type as manufactured by Armstrong.
   2. Classification: Panels fitting ASTM E1264 for Type III, Form 2, Pattern CD. Panels fitting ASTM E84 Class A.
   4. Surface Finish: Manufacturer’s standard factory applied finish.
   5. Light Reflectance Coefficient: 0.81.
   6. Noise Reduction Coefficient: 0.55.
   7. Ceiling Attenuation Coefficient: 35.
   8. Edge Detail: Square Lay-In for 15/16 inch grid.
10. Size: 24 x 24-inches.
11. Fire Performance: USG’s “Firecode”; Armstrong’s “Fire Guard”.

D. Washable Acoustical Panels (Type ACT-2): Water felted, mineral base with membrane faced overlay. Provide acoustical panels complying with the following:
   1. Product: USG “Clean Room Class 100” with “ClimaPlus” (unperforated). Other acceptable product is Armstrong “Clean Room VL” with “HumiGuard Plus”.
   2. Classification: Panels fitting ASTM E1264 for Type X, Pattern GI. Panels fitting ASTM E84 Class A.
   5. Light Reflectance Coefficient: 0.79.
   7. Edge Detail: Square Lay-In for 15/16 inch grid.
   8. Thickness: 5/8-inch minimum.
   9. Size: 24 x 24-inches.
10. USDA approved for incidental food contact.
11. Fire Performance: USG’s “Firecode”, Armstrong’s “Fire Guard”.

E. Ceiling tile is part of UL Design assembly for rated roof/ceiling assemblies.

2.02 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard indirect-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.

B. Manufacturers:
   1. USG Interiors, Inc.
   2. Armstrong World Industries, Inc.

C. Systems: Subject to compliance with requirements and as scheduled, provide:
   1. “DXL” with “Firecode” 15/16-inch, exposed tee, heavy duty, and fire-rated system as manufactured by USG, or equal products of one of the specified manufacturers.

D. Wide Face, Capped, Double-Web, Fire-Rated, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prefinished, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 15/16-inch-wide metal caps on flanges.
   1. Structural Classification: Heavy-duty fire rated system.
2. End Condition of Cross Runners: Override (stepped) type.
3. Face Design: Flat, flush.
6. Suspension system part of a UL Design for rated roof/ceiling assembly.

E. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Indirect Hung, unless otherwise indicated.

F. Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.
   1. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
   2. For each suspension system, provide suspension system and manufacturer's standard edge moldings that match width and configuration of exposed runners.

2.03 ACOUSTICAL SEALANT

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements:
   1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

B. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

C. Products: Subject to compliance with requirements, provide one of the following:
   1. Acoustical Sealant for Exposed and Concealed Joints:
      a. PL Acoustical Sealant; Chemrex, Inc., Contech Brands.
      b. AC-20 FTR Acoustical and Insulation Sealant; Pecora Corp.
      c. SHEETROCK Acoustical Sealant; United States Gypsum Co.
   2. Acoustical Sealant for Concealed Joints:
      a. BA-98; Pecora Corp.
      b. Tremco Acoustical Sealant; Tremco, Inc.

2.04 RATED CEILING ASSEMBLIES

A. Light Fixture Insulation for Rated Ceiling Assemblies: Thermafiber’s “FixtureShield”, lightweight prefabricated kits designed to cover light fixtures, speakers, HVAC diffusers, and other ceiling penetrations where required by UL fire rating for floor/ceiling and roof/ceiling assemblies.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other
Sections that affect ceiling installation and anchorage, and other conditions affecting performance of acoustical panel ceilings.

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

3.02 PREPARATION

A. Coordination: Furnish layouts for clips, and other ceiling anchors whose installation is specified in other Sections.

B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.03 INSTALLATION

A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

3. Direct clip to metal suspension members.
4. Space clips not more than 48 inches o.c. along each member supported directly from metal suspension members, unless otherwise indicated; and provide direct clips not more than 8 inches from ends of each member.

B. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

C. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

D. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Arrange directionally patterned acoustical panels as follows:
   a. As indicated on reflected ceiling plans.
2. Paint cut panel edges remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
3. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated or required.

3.04 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for
cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Resilient Sheet Vinyl Flooring (RSF)
   2. Resilient Sheet Flooring Integral Base (RSB)
   3. Floor substrate preparation.

1.03 REFERENCE STANDARDS

A. ASTM International:
   1. ASTM D2047 Standard Test Method for Static Coefficient of Friction
   2. ASTM E648 Standard Test Method of Critical Radiant Flux
   3. ASTM E662 Standard Test Method of Specific Optical Density of Smoke
   4. ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
   5. ASTM F970 Standard Test Method of Static Load Limit
   7. ASTM F 3010 Standard Practice for Two -Component Resin Based Membrane Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings
   8. DIN 51130 Slip Resistance Test
   9. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

1.04 ACTION SUBMITTALS

A. Product Data: Submit manufacturer’s current printed product literature, specifications, and installation instructions, including the Wet Area Installation Practices Guide and the Kitchen Detailing Guide.

B. Shop Drawings: Include flooring layouts, edges, columns, doorways, enclosing partitions, cabinets, and cutouts.
   1. Show details of special cut-in graphics.

C. Samples: Manufacturer’s standard-size samples showing full color range selection.

D. Written moisture test report.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.
1.06 CLOSEOUT SUBMITTALS
   A. Operation and Maintenance Data: For each type of floor to include in maintenance manuals.

1.07 MATERIALS MAINTENANCE SUBMITTALS
   A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
      1. Vinyl Sheet Flooring: Provide 2 percent extra materials and store where directed, properly packaged and labeled.

1.08 QUALITY ASSURANCE
   A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for resilient flooring installation indicated.
      1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.
      2. Employ only experienced, trained, factory approved mechanics for installation of heat-welded seam systems.
   B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
      1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
   C. Mock-Ups: Install at project site a job mock-up using acceptable products and manufacturer approved installation methods, including concrete substrate testing.
      1. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
      2. Incorporation: Mock-up may be included into final construction upon Owner’s approval.
   D. Pre-Installation Meeting: Convene a pre-installation meeting to verify project requirements, substrate conditions, manufacturer’s installation instructions, manufacturer’s warranty requirements, and installer qualifications.
   E. Bond Test: Install multiple bond tests using a 3’x3’ pieces of material adhered with the appropriate adhesive to verify quality of adhesion. Remove half of each piece after 24 hours, then the other half after 48 hours. To help assess resistance to indentation, place end user equipment onto a sample for 72 hours. Document all results.

1.09 DELIVERY, STORAGE, AND HANDLING
   A. Store resilient flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C). Store floor tiles on flat surfaces.

1.10 PROJECT CONDITIONS
   A. Comply with manufacturer’s requirements for project conditions including the following:
      1. Maintain ambient temperatures of 68 deg F (18 deg C) and 80 deg F (26 deg C) in spaces to receive resilient products for 72 hours before installation, during installation and 24 hours after installation.
2. Maintain the ambient relative humidity between 40 percent and 60 percent during installation.
3. Allow sufficient time for proper preparation, installation and cuing.
4. Close spaces to traffic during resilient flooring installation until the installer is satisfied the adhesive has set.
5. Verify permanent HVAC is operational. If temporary heat is required, use electric or indirect heat sources. Do not use kerosene or propane in direct contact with the ambient air.
6. Verify other finishing operations, including painting, have been completed.
7. Where demountable partitions and other items are indicated for installation on top of sheet resilient flooring material, install flooring material before these items are to be installed.
8. Coordinate with plumbing subcontractor that approved surface membrane clamping drainage connections will be used, including but not limited to, surface clamping round drains, surface clamping trench drains, surface clamping floor sinks, surface clamping grease traps, or use of Altro Gulley Angle/Edge, or employment of Altro’s Modified Surface Clamping Drain System.
9. Conform to all pertinent ASTM, ACI and Altro Standards listed in, but not limited to, this specification.

1.11 WARRANTY

A. Warranty: Provide manufacturer’s standard limited warranty.

PART 2 - PRODUCTS

2.01 SHEET VINYL FLOORING

A. Slip-Resistant Resilient Sheet Vinyl Flooring (RSF):
   a. Wear Layer/Overall Thickness: 3.0 mm (0.12 inches), with non-directional pattern and slip retardant particulate suspended evenly throughout the product thickness.
   b. Roll/Sheet Width & Length: 6 feet 7 inches (2 m) x 66 feet
   c. Backing: non-woven polyester/cellulose, glass fiber reinforcement.
   d. Slip Resistance: ADA compliant, ASTM D 2047 James Machine, SCoF Dry .92 / Wet 0.88 DIN 51130 Ramp Test - R 12
   g. Sustainable Properties: Phthalate-free, contains rapidly renewable bio-based content, 100 percent recyclable, SCS FloorScore Certified, meets CAL Section 01350, contributes to LEED credits for recycled content, adhesives, low VOC emitting material. EPD Environmental Product Declaration and HPD Health Product Declaration Available.
   h. Warranty: 12 Year Limited Manufacturer Warranty
   i. Colors as indicated on Finish Plans.
2. Subject to compliance with requirements provide Basis of Design or pre-bid approved equal in accordance with Section 01 25 00.

2.02 RESILIENT SHEET FLOORING INTEGRAL BASE (RSB) AND SYSTEM ACCESSORIES

A. Vinyl Welding Rod: Acceptable Material
   1. Altro Weld Rod (in matching color): to be used at seams, corners, drains, & transitions (with Gulley Angle/Edge, VisEdge).

B. Cover Former: Acceptable material, sized to suit application:
   1. Altro Cove Former [38R -45mm (1.5") radius]: to be used at base of walls for coving the flooring. Cove Former and Cove should be installed using Altro Double-Sided Contact Tape. *(PEA, confirm cannot/does not use an adhesive)*

C. Drains & Penetrations: Sheet flooring MUST be mechanically fastened to all drain outlets and cleanouts to ensure a permanent watertight installation.

D. Pipes & Penetrations:
   1. AltroMastic (color coordinating): To be used at around any pipe or penetration through the flooring (with the exception of drains).

E. Perimeters/Edging: Acceptable Material, vinyl, sized to suit application:
   1. Altro Gulley Angle [GA 35/25]: This accessory is to be used around every square/rectangular drain, floor sink, and clean out or at edging/start/stop of Altro Flooring.
   2. Altro Gulley Edge [GE 35RE][GE25RE]: This accessory can be used around square/rectangular drains, floor sinks, or clean outs in lieu of the Altro Gulley Angle, if the drain has a flange that can be overlapped by the reducer edge on the Altro Gulley Edge. This accessory can also be used to make a transition from Altro flooring to concrete or as edging/start/stop of Altro Flooring.
   3. Altro Visedge [Visedge VR]: This accessory is to be used when butting Altro safety floors to non-weldable products such as quarry tile, epoxy or concrete.

F. Cap Strip: Acceptable material, sized to suit application:
   1. Altro Cap Strip [C7]: Transition cap between Altro Flooring and Existing Wall Coverings, CMU, and Painted Drywall
   2. Altro Cap Strip [C8]: Color: White; Description: “h” shaped cap with 8mm shelf. Transition cap between Altro Flooring and Ceramic Tile.

2.03 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Concrete Seal: VAP 1 2000 FS as manufactured by Koester American Corporation, or Dramatic Surface Products DSP 508 as manufactured by Specialty Construction Brands, Inc.; or approved equal. *(PEA check compatible for asbestos abatement and LVT)*

C. Adhesives:
   1. Altrofix 30 – 2 part polyurethane for areas with at least one drain or where heavy surface water use and/or heavy rolling loads
2.04 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

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

2.05 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
   4. Moisture Testing: Perform tests recommended by manufacturer and as follows, and after slabs have been properly prepared and cleaned, but not more than 7 days prior to installation of finish flooring materials. Proceed with installation only after substrates pass testing.
      a. Perform anhydrous calcium chloride test in accordance with ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) or rate equal to or less than flooring manufacturer’s written recommendation.
      b. Perform relative humidity test using in situ probes in accordance with ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement or percentage equal to or less than flooring manufacturer’s written recommendation.

5. Provide concrete seal at 100 square feet per gallon, as required to provide substrate moisture level within the flooring manufacturer’s acceptable limits.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install flooring materials until they are same temperature as space where they are to be installed.
   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.
2.06 INSTALLATION

A. Install products in strict accordance with manufacturer’s instructions and approved submittals. Use installation method suitable for substrate and project conditions.

B. The installation of Altro Stronghold 30 in a wet environment is a system installation. All circular drain covers must be Surface-Membrane Clamping Style Drains and installed per the instructions in the Altro Flooring installation guide. (PEA, confirm w/plumb spec.) The Gulley Edge/Angle, AltroMastic, Cove Former, and Cap Strip Accessories are necessary accessories for a water-tight and manufacturer-compliant installation.

C. Proceeding with the installation means the installer’s acceptance that substrates are acceptable for installation of resilient flooring.

D. Install with Altro adhesive specified for the site conditions.

E. Install rolls in sequential order following roll numbers on the labels.

F. Do not reverse sheets unless instructed otherwise by manufacturer’s technical representative.

G. Immediately place the flooring into the wet adhesive. Roll spread adhesive with acceptable nap paint roller before setting flooring into adhesive.

H. Roll the flooring in both directions using a 100-150 lb 3 section roller.

I. Heat-weld all seams, vertical and horizontal. Allow 12 hours cure time before heat-welding.

J. When flash-coving, use manufacturer’s recommended accessories for cove former, cap, edging and other details.

2.07 CLEANING AND PROTECTION

A. Comply with manufacturer’s written instructions for cleaning and protection of flooring.

B. Perform the following operations immediately after completing flooring installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.

C. Protect flooring products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
   1. Never use tapes on the surface on the finish flooring
   2. Never use Sharpies, pens, crayons or construction markers on either the finish flooring or the substrate.
   3. No traffic for 24 hours after installation, unless approved by manufacturer’s technical department.
   4. No heavy traffic, rolling loads, or furniture placement for 72 hours after installation.

D. Cover flooring until Substantial Completion.
E. Wait 72 hours after installation before performing initial cleaning. Start a regular maintenance program after the initial cleaning as recommended by manufacturer.

1. Altro Recommended Maintenance: *(PEA revise to generic cleaning solution info)*
   a. Sweep debris
   b. Mix AltroClean44 Cleaner to the Appropriate Dilution Ratio:
   c. Normal Cleaning: 1:40 with warm water
   d. Kitchen/Deep Cleaning: 1:10 with warm water
   e. Apply Diluted Cleaning Solution to floor with pump-sprayer or synthetic-fiber mop
   f. Allow 5 minutes work time for cleaning product on floor
   g. Use Deck Brush or Altro Unipad to scrub floor
   h. Rinse thoroughly.

END ☐F SECTION ☐N 09 65 16
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary
   Conditions and Division 01 Specifications Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Resilient Tile Flooring - Luxury Vinyl Tile (LVT)
   2. Resilient base (RB).
   3. Floor substrate preparation.

1.03 REFERENCE STANDARDS

A. ASTM International:
   1. D 2047 Standard Test Method for Static Coefficient of Friction
   2. E 662 Standard Test Method for Specific Optical Density of Smoke Generated by
      Solid Materials
   3. F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient
      Flooring
   4. F 970 Standard Test Method for Static Load Limit
   5. F 1700 Standard Specification for Vinyl Floor Tile
      Floor Slabs Using In Situ Probes

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each type of resilient flooring. Include flooring layouts, edges,
columns, doorways, enclosing partitions, cabinets, and cutouts.
   1. Show details of special patterns.

C. Samples for Initial Selection: For each type of flooring indicated.

D. Samples for Verification: Full-size units of each color and pattern of flooring required.

E. Written moisture test report.

F. Product Schedule: For resilient flooring.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.
1.06 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor to include in maintenance manuals.

1.07 MATERIALS MAINTENANCE SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
   2. Resilient Bases: Colors assorted in proportion to those installed.
      a. Four (4) preformed outside corners and four (4) 48-inch (1219-mm) pieces of 4-inch (102-mm) topset cove type.

1.08 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for resilient flooring installation indicated.
   1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.

B. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Store resilient flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

1.10 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive flooring during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Close spaces to traffic during flooring installation.

D. Close spaces to traffic for 48 hours after flooring installation.

E. Install flooring after other finishing operations, including painting, have been completed.

1.11 WARRANTY

A. Warranty: Provide manufacturer’s standard limited warranty.
PART 2 - PRODUCTS

2.01 LUXURY VINYL TILE FLOORING MATERIALS

A. Luxury Vinyl Tile Flooring

   a. Classification: ASTM F1700, Class III, Type B
   b. Gauge: 2.5mm
   c. Wear Layer: 0.5 mm (20.0 mil)
   d. Size: 18 by 18-inches (457.2 mm x 457.2 mm)
   e. Carton: 40.5 sq. ft. per case
   f. Edges: Square Edge
   g. Installation Method: Direct Glue
   h. Colors as indicated on Finish Plans.

2. Subject to compliance with requirements provide Basis of Design or pre-bid approved equal in accordance with Section 01 25 00.

2.02 RESILIENT BASE AND MOLDING MATERIALS

A. Resilient Bases

1. **(RB):** Johnsonite, or equal product from one of the specified manufacturers, commercial series rubber, minimum of 5 colors as scheduled, 1/8-inch (3.175-mm) gauge, height 4-inches (102-mm), unless otherwise indicated, and supplied in rolls.
   2. Outside corners shall be factory molded.
   3. Exposed ends of cove base shall be molded end stops.
   4. Cove base shall be topset type.
   5. Colors as indicated on Finish Plans.
   6. Other acceptable manufacturers:
      a. Roppe Rubber Corporation.
      b. Burke Flooring Products.
      c. Allstate.
      d. Flexco.

2.03 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated. [PEA check compatible for asbestos abatement and LVT](https://www.peacheck.com/)

B. Concrete Seal: VAP 1 2000 FS as manufactured by Koester American Corporation, or Dramatic Surface Products DSP 508 as manufactured by Specialty Construction Brands, Inc.; or approved equal. [PEA check compatible for asbestos abatement and LVT](https://www.peacheck.com/)

C. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.
   1. Transitional vinyl adhesive Novalis type NFA-T226 (available from Capri) shall be used in full spread applications. Apply adhesive according to manufacturer’s recommendations.
2. Adhesives shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   a. Luxury Vinyl Tile Adhesives: Not more than ## g/L.
3. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

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

3.02 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
   4. Moisture Testing: Perform tests recommended by manufacturer and as follows, and after slabs have been properly prepared and cleaned, but not more than 7 days prior to installation of finish flooring materials. Proceed with installation only after substrates pass testing.
      a. Perform anhydrous calcium chloride test in accordance with ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) or rate equal to or less than flooring manufacturer’s written recommendation.
      b. Perform relative humidity test using in situ probes in accordance with ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement or percentage equal to or less than flooring manufacturer’s written recommendation.
   5. Provide concrete seal at 100 square feet per gallon, as required to provide substrate moisture level within the flooring manufacturer’s acceptable limits.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
D. Do not install flooring materials until they are the same temperature as the space where they are to be installed.
   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.03 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas where covers were made to accept installation of flooring material. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections. Where spray adhesive is used, follow manufacturer’s instructions.

3.04 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.
F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.05 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of flooring.

B. Perform the following operations immediately after completing flooring installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.

C. Initial Maintenance: Conduct a full initial maintenance following the latest edition of the manufacturer’s maintenance instructions.

D. Protect flooring products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

E. Cover flooring until Substantial Completion.

END OF SECTION 09 65 19
PART 1 - GENERAL

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

1.02 SUMMARY
   A. This Section includes applied Wall Graphics.

1.03 SUBMITTALS
   A. Product Data: For each type of product indicated, including maintenance instructions
   B. Samples: For printed wall graphics, labeled with material name and SKU information.
   C. Shop Drawings: For each wall graphic, provide a proof.

1.04 DELIVERY AND STORAGE
   A. Deliver wall graphics to the job site in original packaging, properly identified and labeled.
   B. Store materials in original packaging, maintained in a clean, dry, protected area where temperature and humidity remains stable and within the acceptable range as recommended by manufacturer.
   C. Prior to storage, inspect printed wall graphics to confirm that the product conforms to the submittal.

1.05 PROJECT CONDITIONS
   A. Areas where wall graphics are to be install should be environmentally controlled by the permanent HVAC system. Maintain temperature range between 65 and 85 degrees F, with maximum relative humidity of 50 percent, for a period of at least 4 days prior to installation of the wall graphics. Maintain environmental conditions after installation for the duration of construction.
   B. Gypsum Board Walls to have a Level 5 finish as indicated in Section 09 21 16 – Gypsum Board Assemblies. Refer to manufacturer installation instruction for additional finish requirements.
   C. Lighting: During installation provide adequate lighting as recommended by manufacturer for installation.
PART 2 - PRODUCTS

2.01 WALL GRAPHICS

A. Basis of Design: C2 Imaging, contact Abby Ross, abby.ross@c2imaging.com, https://www.c2spark.com/, or approved equal.

B. Wall Graphic Material
      a. Material: 3M180 with overlam matt finish.

2.02 ACCESSORIES

A. Adhesive: Manufacturer recommend adhesive for substrate indicated.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
   1. Moisture Content: Maximum of 7 percent on when tested with an electronic moisture meter.

B. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

C. File Setup Instructions:
   1. Convert Colors to CMYK.
   2. Bleed-Add 3-inches left, 3-inches right, and 3-inches bottom.
   3. Crop Marks – add 1/4-inch crop to each file.
   4. Raster images to be a minimum 100 dpi at final output size.
   5. Graphic format: AI, Vector art, print ready PDF.

3.02 INSTALLATION

A. Install in accordance with manufacturer recommendations for each substrate and film application.

B. Install wall graphic with 1/2-inch overlaps, no lifted or curling edges, and no visible shrinkage.

C. Fully bond wall graphic to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

D. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.

END OF SECTION 09 72 00
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.
   1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
   1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
   1. Prefinished items include the following factory-finished components:
      a. Architectural woodwork.
      b. Finished mechanical and electrical equipment.
      c. Light fixtures.
   2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
      a. Foundation spaces.
      b. Furred areas.
      c. Ceiling plenums.
      d. Utility tunnels.
      e. Pipe spaces.
      f. Duct shafts.
      g. Elevator shafts.
   3. Finished metal surfaces include the following:
      a. Anodized aluminum.
      b. Stainless steel.
      c. Chromium plate.
   4. Operating parts include moving parts of operating equipment and the following:
      a. Valve and damper operators.
      b. Linkages.
      c. Sensing devices.
      d. Motor and fan shafts.
5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.03 SUBMITTALS

A. Product Data: For each paint system indicated. Include block fillers and primers.
   1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
   2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

B. Samples for Initial Selection: For each type of finish-coat material indicated.

C. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
   1. Minimum size 6 inches by 6 inches.

D. Maintenance Submittals: Provide a coating maintenance manual, either bound or in a three-ring binder marked on the spline with the title. The manual shall include:
   1. Each product used on the project.
      b. Material Safety Data Sheet.
      c. Care and maintenance information, including touch-up procedures.
      d. An 8 x 10-inch card painted with each color and each sheen of each color of the product used on the project.
   2. A matrix or other format of schedule indicating the location in each room of each color and sheen of each product used.
   3. Details of areas where special effects or special instructions on painting were provided.

1.04 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.
   1. Architect will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate.
      a. Wall Surfaces: Provide samples on at least 100 sq. ft.
      b. Small Areas and Items: Architect will designate items or areas required.
   2. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.
      a. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.
   3. Final approval of colors will be from benchmark samples.
1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
   1. Product name or title of material.
   2. Product description (generic classification or binder type).
   3. Manufacturer's stock number and date of manufacture.
   4. Contents by volume, for pigment and vehicle constituents.
   5. Thinning instructions.
   6. Application instructions.
   7. Color name and number.
   8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
   1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.06 PROJECT CONDITIONS

A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.

B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.

C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
   1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.07 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.
   1. Quantity: Furnish Owner with an additional 3 percent, but not less than 1 gal. or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products scheduled.

B. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
   1. Benjamin Moore & Co. (Benjamin Moore).
   2. PPG Industries, Inc. (Pittsburgh Paints).
2.02 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
   1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. Chemical Components of Interior Paints and Coatings: Provide products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions:
   1. Flat Paints and Coatings: VOC content of not more than 50 g/L.
   2. Non-Flat Paints and Coatings: VOC content of not more than 150 g/L.
   3. Anticorrosive Coatings: VOC content of not more than 250 g/L.
   4. Varnishes and Sanding Sealers: VOC content of not more than 275 g/L.
   5. Stains: VOC content of not more than 250 g/L.
   6. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
   7. Restricted Components: Paints and coatings shall not contain any of the following:
      a. Acrolein.
      b. Acrylonitrile.
      c. Antimony.
      d. Benzene.
      e. Butyl benzyl phthalate.
      f. Cadmium.
      g. Di (2-ethylhexyl) phthalate.
      h. Di-n-butyl phthalate.
      i. Di-n-octyl phthalate.
      j. 1,2-dichlorobenzene.
      k. Diethyl phthalate.
      l. Dimethyl phthalate.
      m. Ethylbenzene.
      n. Formaldehyde.
      o. Hexavalent chromium.
      p. Isophorone.
      q. Lead.
      r. Mercury.
      s. Methyl ethyl ketone.
      t. Methyl isobutyl ketone.
      u. Methylene chloride.
      v. Naphthalene.
      w. Toluene (methylbenzene).
      x. 1,1,1-trichloroethane.
PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.
   1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
   2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
   1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.02 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
   1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
   1. Provide barrier coats over incompatible primers or remove and reprime.
   2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
      a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
      b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
      c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.

y. Vinyl chloride.
3. **Wood:** Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off:
   a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
   b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
   c. If transparent finish is required, backprime with spar varnish.
   d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
   e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

4. **Ferrous Metals:** Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
   a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.
   b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
   c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.

5. **Galvanized Surfaces:** Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

6. **Ceramic Wall Tile:** Remove all surface contamination by washing with an appropriate cleaner, such as Simple Green. Rinse thoroughly and allow to dry. Sanding or dulling with an abrasive cleaner is recommended on glossy, extremely hard surfaces for maximum adhesion. See the product’s data sheet for complete application information.

D. **Material Preparation:** Mix and prepare paint materials according to manufacturer's written instructions.
   1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
   2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
   3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. **Tinting:** Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

**3.03 APPLICATION**

A. **General:** Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convactor covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
10. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has curd as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer over metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
F. Mechanical items to be painted include, but are not limited to, the following:
1. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
2. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
3. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

G. Electrical items to be painted include, but are not limited to, the following:
1. Switchgear.
2. Panelboards.
3. Electrical equipment that is indicated to have a factory-primed finish for field painting.

H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
1. Provide satin finish for final coats.

L. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

M. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.04 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:
1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
2. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.
3.05 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.06 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.07 PAINTING SCHEDULE

A. Masonry and Concrete- Vertical Surfaces
1. Semi-Gloss Finish- Low VOC Topcoat
   a. Primer: PPG Paints Perma-Crete Alkali-Resistant Primer 4-603
   c. Topcoat: PPG Paints Speedhide zero Interior Zero VOC Latex Semi-Gloss 6-4510XI

B. Concrete Masonry Unit (CMU)
1. Semi-Gloss Finish- Low VOC Topcoat
   a. Primer: PPG Paints Speedhide Hi Fill Latex Block Filler 6-15XI
   c. Topcoat: PPG Paints Speedhide zero Interior Zero VOC Latex Semi-Gloss 6-4510XI

C. Gypsum Board
1. Eggshell Finish- Low VOC Topcoat
   a. Primer: PPG Paints Speedhide zero Interior Zero VOC Latex Primer 6-4900XI
      1) At High-Impact Gypsum Wallboard: Primer Finish – 40% weight solids content: S-W High Build Interior Latex Primer B28W08601 by Sherwin Williams, or approved equal. Comply with manufacturer’s recommendations on surface preparation and application.
   c. Topcoat: PPG Paints Speedhide zero Interior Zero VOC Latex Eggshell 6-4310XI

D. Ceramic Wall Tile
1. Eggshell Finish- Low VOC Topcoat
   a. Primer: Sherwin Williams Extreme Bond Primer B51-150
b. Intermediate Coat: Sherwin Williams Pro Industrial Pre-Catalyzed WB Epoxy, K-45-150 Eg-Shel
c. Topcoat: Sherwin Williams Pro Industrial Pre-Catalyzed WB Epoxy, K-45-150 Eg-Shel

E. Wood
1. Semi-Gloss Finish- Low VOC Topcoat- Painted Finish
   a. Primer: PPG Paints Speedhide zero Interior Zero VOC Latex Primer 6-4900XI
   c. Topcoat: PPG Paints Speedhide zero Interior Zero VOC Latex Semi-Gloss 6-4510XI

F. Ferrous Metal
1. Primer: PPG Pitt Tech Plus DTM Acrylic Primer 90-912
3. Topcoat: PPG Pitt Tech Plus DTM Acrylic Semi-Gloss 90-1210

G. Galvanized and Aluminum Metal
1. Primer: PPG Pitt Tech Plus DTM Acrylic Primer 90-912
3. Topcoat: PPG Pitt Tech Plus DTM Acrylic Semi-Gloss 90-1210

H. Metal Decking
1. Primer: PPG Pitt Tech Plus DTM Acrylic Primer 90-912 (Not required on Galvanized Metal)
2. Finish: PPG Paints Speedhide Super Tech Flat Latex Dryfall 6-725XI

I. PVC- Piping etc.
1. Primer: PPG Paints Seal Grip Acrylic Universal Primer 17-921
3. Topcoat: PPG Pitt Tech Plus DTM Acrylic Semi-Gloss 90-1210

3.08 EXTERIOR SCHEDULE

A. Masonry and Concrete
1. Flat Finish
   a. Primer: PPG Paints Perma-Crete Alkali-Resistant Primer 4-603
   b. Intermediate Coat: PPG Paints Speedhide Exterior 100% Acrylic Flat Latex 6-610XI
   c. Topcoat: PPG Paints Speedhide Exterior 100% Acrylic Flat Latex 6-610XI

B. Existing Plaster
1. Elastomeric System
   a. Primer: PPG Paints Perma-Crete Alkali-Resistant Primer 4-603
   b. Intermediate Coat: PPG Paints Perma-Crete Elastomeric Coating 4-110XI
   c. Topcoat: PPG Paints Perma-Crete Elastomeric Coating 4-110XI

C. Ferrous Metal
1. Primer: PPG Pitt Tech Plus DTM Acrylic Primer 90-912
3. Topcoat: PPG Pitt Tech Plus DTM Acrylic Semi-Gloss 90-1210
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Panel signs.
      a. Furnish and install interior panel signs in the following locations:
         1) Each door included in door schedule.
         2) Provide signage that includes international symbol of accessibility at all doors for toilet rooms.

1.03 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.

B. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, font, spacing, reinforcement, accessories, and installation details.
   1. Provide message list for each sign, including large-scale details of wording, lettering, artwork, and Braille layout.

C. Samples for Initial Selection: For each type of sign material that involves color selection.

D. Qualification Data: For Installer.

E. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative of signage manufacturer for installation and maintenance of units required for this Project.

B. Source Limitations: Obtain each sign type through one source from a single manufacturer.

C. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.
   1. Interior Code Signage: Provide signage as required by accessibility regulations and requirements of authorities having jurisdiction.
1.05 PROJECT CONDITIONS

A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

1.06 COORDINATION

A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.
   1. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.

PART 2 - PRODUCTS

2.01 PANEL SIGNS

A. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
   1. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally.

B. Manufacturers:
   1. Allenite Signs; Allen Marking Products, Inc.
   3. APCO Graphics, Inc.
   4. ASI-Modulex.
   5. Best Manufacturing Co.
   6. Innerface Sign Systems, Inc.
   7. Mills Manufacturing, Inc.

C. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to comply with the following requirements:
   1. Edge Condition: Square cut.
   2. Corner Condition: Square.

D. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated to acrylic backing sheet to produce composite sheet.
   1. Composite-Sheet Thickness: 0.125 inch
   3. Lettering: ¾ inch high letters, and 1 inch high numerals.

E. Tactile and Braille Copy: Manufacturer's standard process for producing copy complying with ADA Accessibility Guidelines and ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square cut edges free from burrs and cut marks.

F. Raised Copy: Provide up to twenty (20) characters for letters, up to four (4) characters for numbers. Provide accompanying raised braille.

G. Room signs, excluding utility, storage, and toilet rooms:
1. Provide one – 1-1/2 inch high window with Lexan insert in lieu of raised letters.

H. Directory:
   1. Size: 12 inch by 12 inch
   2. Provide up to seventy (70) characters and directional arrows

I. Mounting: Mechanical Fastening. Mounting by means of doubled faced adhesive tape shall not be acceptable.
   1. Drill and insert appropriate type plugs or expansion anchors into wall substrate.
   2. Attach signs to wall using countersunk tamperproof screws. Screw heads shall be flush with sign face.
   3. Mount signs so that bottom of the letters above finished floor surface is 48 inch minimum to 54 inches maximum.

2.02 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.03 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items, including anchor inserts, provided under other sections of Work are sized and located to accommodate signs.

C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.

D. Proceed with installation only after unsatisfactory conditions have been corrected.
3.02 INSTALLATION

A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.
   1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.

B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:
   1. Silicone-Adhesive Mounting: Use liquid-silicone adhesive recommended in writing by sign manufacturer to attach signs to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended in writing by sign manufacturer to hold sign in place until adhesive has fully cured.
   2. Where panel signs are scheduled or indicated to be mounted on glass, provide matching plate on opposite side of glass to conceal mounting materials.

C. Vertical Mounting:
   1. Mount plaque signs at 48-inch minimum from the finished floor to the baseline of the lowest tactile character and 60-inch maximum from the finished floor to the baseline of the highest tactile character.

D. Horizontal Mounting:
   1. Mount plaque signs at 15-inches (381-mm) from latch-side door jamb to centerline of sign on wall, unless shown otherwise.
   2. At locations where a window is adjacent to door, Architect will select mounting location in field.

3.03 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.
PART 1 - GENERAL

1.01 RELATED DOCUMENTS:
   A. Drawings and general provisions of the Contract, including General and Supplementary
      Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY
   A. The Work of this Section includes metal corner guards.

1.03 SUBMITTALS
   A. Manufacturer's Data: Submit copies of manufacturer's detailed technical data for materials,
      fabrication and installation. Include catalog cuts of hardware, anchors, fastenings, and
      accessories.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING
   A. Deliver corner guards in manufacturer's original unopened protective packaging.
   B. Store to prevent soiling and physical damage.
   C. Maintain protective covers on units until installation is complete.

1.05 COORDINATION
   A. Coordinate work under this Section with that of other trades whose work affects or is
      affected by this work.

1.06 MEASUREMENTS
   A. Take all necessary measurements at the building to assure proper fitting and fabrication of
      crash rails, corner guards, and wall protection. Take into account variations of adjacent
      construction and adjust products and installation accordingly.

PART 2 - PRODUCTS

2.01 MANUFACTURER:
   A. Basis of Design: ACO-8 Acrovyn Corner Guards by Construction Specialties or a
      comparable product by one of the following
      1. InPro Corporation
      2. Pawling Corporation

2.02 METAL CORNER GUARDS
   A. Surface-mounted corner guard.
      1. Metal: 0.63 inch thick aluminum.
2. Legs: 3-1/2 inch on each side.
3. Height: 48 inches, bottom of corner guard installed directly above floor base.

2.03 INSTALLATION MATERIALS

A. Corner guards to be fastened and adhered to wall.
   1. Adhesive for Corner Guards: Dow Corning, or approved equal. Provide adhesive recommended by manufacturer for adhering corner guards to gypsum wall board, concrete masonry units, and ceramic wall tile wall surfaces.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
   1. Examine walls to which corner protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
   2. For corner protection units attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
   3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install corner guards plumb and level in strict accordance with manufacturer's data and installation recommendations, anchoring all components firmly and securely to structure.

END □ F SEC□□N 10 26 00
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Toilet room and bathroom accessories.
   2. Installation of toilet room accessories furnished by Owner.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated include the following:
   1. Construction details and dimensions.
   2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
   3. Material and finish descriptions.
   4. Features that will be included for Project.
   5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
   1. Identify locations using room designations indicated on Drawings.
   2. Identify products using designations indicated on Drawings.

1.04 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.


C. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

D. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
E. Structural Backing: Fire-retardant plywood or sheet metal plates as specified in Sections 06 10 00 and 09 21 16, respectively.

2.02 OWNER FURNISHED, CONTRACTOR INSTALLED ACCESSORIES

A. Soap Dispenser (TA-01)
B. Paper Towel Dispenser (TA-02)
C. Toilet Tissue Dispenser (TA-03)

2.03 ACCESSORIES, GENERAL

A. Manufacturers: Subject to compliance with requirements provide products by one of the following
   1. Bobrick Washroom Equipment, Inc.
   2. ASI Group.

2.04 TOILET ROOM AND BATHROOM ACCESSORIES

A. Grab Bar (TA-05, TA-06, TA-08, TA-12)
   1. Mounting: Flanges with concealed fasteners.
   2. Material: Stainless steel, 0.05 inch thick.
      a. Finish: Smooth, No. 4, satin finish.
   3. Outside Diameter: 1-1/2 inches
   4. Configuration and Length: As indicated on Drawings.

B. Robe Hook (TA-09)
   1. Mounting: Flange with concealed fasteners.
   2. Material: Stainless steel, 0.05 inch thick.
      a. Finish: Smooth, No. 4, satin finish.
   3. Flange: 2-inches x 2-inches.

C. Sanitary Napkin Disposal Unit (TA-10)
   1. Mounting: Surface mounted.
   2. Features: Cabinet, door, and receptacle: 22 gauge stainless steel. Cabinet shall have all welded construction. Door shall be self-closing and secured to cabinet with spring loaded continuous stainless steel piano hinge. Receptacle shall be equipped with tumbler lock.
   3. Capacity: 1.2 gallons

D. Mirrors (TA-11)
   1. Mounting: Concealed locking screws for attachment to concealed galvanized wall hangers. Provide additional lower support brace for mirrors taller than 24 inch.
   2. Features:
      a. Frame: 1/2” x 1/2” x 1/2” stainless steel channel, bright polished finish, mitered corners, with galvanized steel back.
b. Mirror: No. 1 quality, 1/4” float/plate glass guaranteed for 10 years against silver spoilage.


E. Mop Strip (Janitor Closets)
   2. Mop and Broom Holders: Spring-loaded rubber cams with plated steel retainers.
   3. Manufacturer and Model: Bobrick Washroom Equipment, Inc., B-223 x 24”.

2.05 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. EXECUTION

2.06 PREPARATION

A. Install structural backing for accessories according to manufacturers' requirements and as indicated on Drawings.

2.07 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446.

2.08 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 10 28 00
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes portable fire extinguishers and fire-protection cabinets.

1.03 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.
   1. Fire Extinguishers: Include rating and classification.
   2. Fire-Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, fire rating, door hardware, cabinet type, trim style, and panel style.

B. Maintenance Data: For fire extinguishers and fire-protection cabinets to include in maintenance manuals.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

D. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

1.05 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
B. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

2.02 PORTABLE FIRE EXTINGUISHERS

A. Manufacturers:
1. Amerex Corporation.
2. Ansul Incorporated.
3. JL Industries, Inc.
5. Larsen's Manufacturing Company.
6. Potter Roemer; Div. of Smith Industries, Inc.

B. General: Provide fire extinguishers of type, size, and capacity for each fire-protection cabinet indicated.
2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

C. Regular Dry-Chemical Type: UL-rated 4-A: 60-B:C, 10-lb nominal capacity, with sodium bicarbonate-based dry chemical in manufacturer's standard enameled container.

2.03 FIRE-PROTECTION CABINETS

A. Manufacturers:
1. JL Industries, Inc.
2. Kidde Fyrnetics.
4. Potter Roemer; Div. of Smith Industries, Inc.

B. Cabinet Types:
1. Type FEC: Suitable for fire extinguisher.

C. Cabinet Construction: Provide rated cabinets where installed in rated partition or wall.
1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch thick, cold-rolled steel sheet lined with minimum 5/8-inch-thick, fire-barrier material. Provide factory-drilled mounting holes.

D. Cabinet Material: Stainless Steel

E. Semirecessed Cabinet: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
1. Rolled-Edge Trim: 2-1/2-inch backbend depth to conform with ADA compliant projection.

F. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.

G. Cabinet Trim Material: Stainless-steel sheet.

H. Door Material: Stainless-steel sheet.

I. Door Style: Vertical duo panel with frame
J. Door Glazing: Opaque acrylic door with scratch-proof lettering on white background with horizontal RED LETTERS with the word “FIRE EXTINGUISHER” on each cabinet.

K. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
   1. Provide recessed door pull and friction latch.
   2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

2.04 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
   1. Weld joints and grind smooth.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

C. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
   1. Miter and weld perimeter door frames.

D. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.05 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.06 STEEL FINISHES

A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.

B. Stainless Steel: Brushed #4 finish

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.
B. Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged units.

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

3.02 PREPARATION

A. Prepare recesses for semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.03 INSTALLATION

A. General: Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

B. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.
   1. Unless otherwise indicated, provide semirecessed fire-protection cabinets.

3.04 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet manufacturer.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 44 00
PART 1 - GENERAL

1.01 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary
      Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY
   A. The Work of this Section includes metal lockers

1.03 SUBMITTALS
   A. Product Data: Submit manufacturer's printed data including materials, accessories,
      construction, finishes, assembly, and installation instructions for lockers.
   B. Shop Drawings: Submit layout and dimensions of metal lockers. Indicate relationship to
      adjoining surfaces. Show locker elevations and details, fillers, trim, base, sloping tops, and
      accessories. Include locker numbering sequence. Indicate installation and anchorage
      requirements.
   C. Samples: Samples showing actual colors prepared on same material to be used for the
      Work.
   D. Maintenance Instructions: Instructions for cleaning lockers and for adjusting, repairing,
      and replacing locker doors and latching mechanisms.

1.04 QUALITY ASSURANCE
   A. Single-Source Responsibility: Obtain locker units and accessories from one manufacturer.
   B. Regulatory Requirements: Where lockers are indicated to comply with accessibility
      requirements, comply with the Americans with Disabilities Act (ADA), Accessibility
      Guidelines for Buildings and Facilities (ADAAG) and ICC A117.1.
      1. Provide hardware that does not require tight grasping, pinching, or twisting of the
         wrist, and that operates with a force of not more than 5 lbf (22.2 N).
      2. Provide not less than five percent (5%) of lockers to be ADA compliant.

1.05 DELIVERY, STORAGE, AND HANDLING
   A. Do not deliver lockers until spaces to receive them are clean, dry, and ready for locker
      installation.
   B. Protect lockers from damage during delivery, handling, storage, and installation.
PART 2 - PRODUCTS

2.01 MATERIALS

A. Steel Sheet: ASTM A 366 (A 366M), commercial-quality, stretcher-leveled, cold-rolled carbon steel sheet, free of buckling, scale, and surface imperfections.

B. Fasteners: Zinc- or nickel-plated steel; slotless-type exposed bolt heads; self-locking nuts or lock washers for nuts on moving parts.

C. Equipment: Manufacturer's standard plated steel hooks or coat rods.

2.02 LOCKERS

A. Lockers: Double tier, 12-inch wide by 12-inch deep by 72-inch high, non-vented, flat top, color as selected by the Architect from manufacturer’s full color line. Provide products by one of the following:
   1. AMP (Art Metal Products)
   2. American Specialties, Inc.
   3. List Industries
   4. Lyon Workspace Products, LLC.
   5. Penco Products, Inc.
   6. Or approved equal.

B. Body: Form backs, tops, bottoms, sides, and intermediate partitions of flanged 0.0239-inch (0.61-mm) minimum steel sheet.
   1. Form exposed ends of lockers of 0.0598-inch (1.5-mm) minimum steel sheet.
   2. Provide lockers meeting accessibility requirements of jurisdictions having authority, equivalent to 5 percent of the total number of lockers being provided, but no fewer than one accessible locker in each locker room or changing room. Provide fixed shelves, doors and latches, and accessories that are accessible.

C. Frames: Form channel frames of 0.0598-inch (1.5-mm) minimum steel sheet. Form continuous integral strike on vertical frame members or weld 0.0897-inch (2.3-mm) minimum latch hooks to latch strike frame.
   1. Cross Frames: Form intermediate channel cross frames of 0.0598-inch (1.5-mm) minimum steel sheet.

D. Door: One-piece steel sheet, flanged at all edges, constructed to prevent springing when opening or closing. Fabricate to swing 180 degrees.
   1. Thickness: 0.0598 inch (1.5 mm) minimum.

E. Hinges: Steel, full-loop, 5- or 7-knuckle tight pin, 2 inches (51 mm) high minimum. Weld to inside of frame and secure to door with not fewer than 2 factory-installed fasteners that are completely concealed and tamperproof when door is closed.
   1. Provide at least 3 hinges for each door over 42 inches (1067 mm) high; at least 2 hinges for each door 42 inches (1067 mm) high or less.

F. Projecting Handle and Latch: Positive automatic, pre-locking, pry-resistant latch and pull with rubber silencers; chromium-plated, heavy-duty, vandalproof lift-up handle, containing strike and eye for padlock; and with 2-point latching.

G. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard baked-enamel finish consisting of a thermosetting topcoat. Comply with paint manufacturer's instructions for application and baking to achieve a minimum dry film
thickness of 1.1 mils (0.028 mm) on doors, frames, and legs, and 0.7 mil (0.018 mm) elsewhere.

2.03 LOCKER ACCESSORIES

A. Equipment: Furnish each locker with 1 double-prong ceiling hook, and not fewer than 2 single-prong wall hooks.

B. Number Plates: Manufacturer's standard etched, embossed, or stamped, nonferrous-metal number plates with numerals not less than 3/8 inch (9 mm) high, black-filled. Number lockers in sequence clockwise starting at left of room entrance. Attach plates to each locker door, near top, centered, with at least 2 fasteners of same finish as number plate.

C. Continuous Metal Base: 16-gauge Steel sheet zee profile for stiffness, fabricated in lengths as long as practicable to enclose base and base ends of lockers without additional fastening devices. Provide blocking under bottom row of lockers.

D. Recess Trim: Manufacturer's standard 0.0478-inch (1.2-mm) minimum steel sheet trim with concealed fastening clips.

E. Filler Panels: 0.0478-inch (1.2-mm) minimum steel sheet, factory fabricated.

F. Finished End Panels: Manufacturer's standard 0.0239-inch (0.61-mm) minimum steel sheet end-finishing panels to conceal exposed ends of non-recessed lockers.

2.04 FABRICATION

A. Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make exposed metal edges free of sharp edges and burrs, and safe to touch. Weld frame members together to form a rigid, 1-piece structure.
   1. Form locker body panels, doors, shelves and accessories from 1-piece steel sheet unless otherwise indicated.
   2. Preassemble lockers by welding all joints, seams, and connections. Grind exposed welds flush.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install metal lockers complete with accessories according to manufacturer's recommendations. Install plumb, level, rigid, and flush.

B. Connect together welded locker groups with standard fasteners according to manufacturer's recommendations, with no exposed fasteners on face frames.

C. Anchor lockers to floors and walls at intervals recommended by manufacturer but no greater than 36 inches (910 mm). Install anchors through back-up reinforcing plates where necessary to avoid metal distortion, using concealed fasteners.

D. Install sloping top units to lockers using concealed fasteners. Provide hairline joints and concealed splice plates.

E. Install finished end panels to conceal exposed ends of non-recessed lockers.
3.02 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.

B. Clean interior and exposed exterior surfaces and polish stainless-steel and nonferrous metal surfaces.

C. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit locker use during construction.

D. Touch up marred finishes, or replace locker units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10 51 13
PART 1 - GENERAL

1.01 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY
   A. This Section includes post-and-shelf metal storage shelving.
   B. Related Sections include Division 06 Interior Architectural Woodwork sections for shelving supported by wall-mounted standards and shelving as part of casework.

1.03 PERFORMANCE REQUIREMENTS
   A. Seismic Performance: Provide accordion folding partitions capable of withstanding the effects of earthquake motions determined according to loads indicated on Structural Drawings.

1.04 SUBMITTALS
   A. Product Data: Include rated capacities, construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal storage shelving.
   B. Shop Drawings: Show fabrication and installation details for metal storage shelving, including upright-to-shelf/arm connections, lateral bracing, and attachments to other work. Include plans, elevations, sections, details, and relationship to other work.
   C. Maintenance Data: For metal storage shelving to include in maintenance manuals.

1.05 QUALITY ASSURANCE
   A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
   B. Source Limitations: Obtain metal storage shelving through one source from a single manufacturer.
   C. Product Options: Drawings indicate size of metal storage shelving and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."
      1. Do not modify intended structural performance and aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
   D. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code--Steel."
1.06 DELIVERY, STORAGE AND HANDLING
   A. Deliver metal storage shelving palleted, wrapped, or crated to provide protection during transit and Project-site storage.

1.07 PROJECT CONDITIONS
   A. Environmental Limitations: Do not deliver or install metal storage shelving until spaces are enclosed and weatherproof, wet work in spaces is completed and dry, and ambient temperature is being maintained at the levels indicated for Project when occupied for its intended use.

1.08 COORDINATION
   A. Coordinate sizes and locations of blocking and backing required for installation of metal storage shelving attached to wall assemblies.
   B. Coordinate locations and installation of metal storage shelving that may interfere with ceiling systems including lighting, HVAC, and sprinklers. Notify Architect in case of conflict.

PART 2 - PRODUCTS

2.01 MATERIALS
   A. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
   B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
   C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with G60 zinc (galvanized) or A60 zinc-iron-alloy (galvannealed) coating.
   D. Post-installed Expansion Anchors in Concrete: With capability to sustain, without failure, a load equal to 4 times the load imposed, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
      1. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition (mild).

2.02 POST-AND-SHELF METAL STORAGE SHELVING
   A. Open Post-and-Shelf Metal Storage Shelving: Factory-formed, field-assembled, freestanding, post-and-shelf metal storage shelving system; designed for shelves to span between and be supported by corner posts, with shelves adjustable over the entire height of shelving unit. Fabricate initial shelving unit with a post at each corner. Fabricate additional shelving units as add-on units, designed to share two corner posts with initial shelving unit. Provide fixed top and bottom shelves, adjustable intermediate shelves, and accessories indicated.
      1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         a. AMP (Art Metal Products)
         b. Hallowell.
         c. Lyon Workspace Products, LLC.
         d. Penco Products, Inc.
2. Posts: Fabricated from 0.0677-inch-thick, cold-rolled steel; in manufacturer's standard shape; with perforations at 1-1/2 inches o.c. to receive shelf-to-post connectors.
   a. Add-On Shelf Posts: 0.0677-inch-thick, cold-rolled steel, T-shaped; perforated to match main posts.
   b. Post Base: Steel foot plate, adjustable, and drilled for mechanical attachment to floor.
3. Bracing: Manufacturer's standard double diagonal cross bracing at back and ends, as required for stability and load-carrying capacity.
4. Solid Shelves: Heavy Duty, Class 1, fabricated from 0.0329-inch-thick, steel sheet.
   a. Fabricate fronts and backs of shelves with box-formed edges, with corners lapped and welded.
5. Shelf Quantity: Four shelves per shelving unit in addition to top and bottom shelf.
7. Base: Open, with exposed post legs.
8. Finish: Manufacturer's standard baked enamel or color coated.

2.03 FABRICATION

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Fabricate metal storage shelving square and rigid with posts plumb and true, and shelves flat and free of dents or distortion. Fabricate connections to form a rigid structure, free of buckling and warping.

C. Shear and punch metals cleanly and accurately. Remove burrs.

D. Form edges and corners free of sharp edges or rough areas. Fold back and crimp exposed edges of unsupported sheet metal to form a 1/2-inch-wide hem on the concealed side; ease edges of metal plate to radius of approximately 1/32 inch.

E. Form metal in maximum lengths to minimize joints. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Weld corners and seams continuously to comply with referenced AWS standard and the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
   5. Weld before finishing components to greatest extent possible. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

G. Build in straps, plates, brackets, and other reinforcements as needed to support shelf loading.
H. Cut, reinforce, drill, and tap metal fabrications to receive hardware, fasteners, and similar items.

I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

J. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.

2.04 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish all steel surfaces, components, and accessories except prefinished stainless-steel and chrome-plated surfaces.

2.05 STEEL AND GALVANIZED STEEL FINISHES

A. Steel Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."

B. Galvanized Steel Surface Preparation: Clean surfaces with non-petroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.

C. Baked-Enamel Finish: Immediately after cleaning and pre-treating, apply manufacturer's standard 2-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil for topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.
   1. Color and Gloss: Color to be selected by Architect from Manufacturer’s standard color range.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine floors for suitable conditions where metal storage shelving will be installed.

C. Examine walls to which metal storage shelving will be attached for properly located blocking, grounds, or other solid backing for attachment of support fasteners.

D. Proceed with installation only after unsatisfactory conditions have been corrected.
3.02 PREPARATION

A. Vacuum finished floor and wet mop resilient flooring over which metal storage shelving is to be installed.

3.03 INSTALLATION

A. Install metal storage shelving level, plumb, square, rigid, and true.
   1. Adjust post base bolt leveler as required to achieve level and plumb installation.
   2. Anchor shelving units to floor with post-installed expansion anchors through foot plate. Shim foot plate as required to achieve level and plumb installation.
   3. Install seismic supports and bracing as recommended by manufacturer and authorities having jurisdiction, and as required for stability. Extend and fasten members to supporting structure.
   4. Connect side-to-side shelving units together at corner posts with support ties.
   5. Install shelves in each shelving unit at spacing indicated on Drawings or, if not indicated, at equal spacing.
      a. Post-and-Shelf Metal Storage Shelving: Install four clips, one at each post, for support of each shelf; with clips fully engaged in post perforations.

3.04 ADJUSTING AND CLEANING

A. Verify that shelves and shelf-to-post connectors adjust easily and properly.

B. On completion of installation, clean exposed surfaces as recommended by manufacturer.

C. Touch up marred finishes or replace metal storage shelving that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal storage shelving manufacturer.
   1. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

D. Replace metal storage shelving that has been damaged or has deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope: Furnish all labor, materials, services, equipment and appliances required to provide and deliver all foodservice equipment hereinafter specified into the building, uncrate, assemble, hang, set-in-place, level, and completely install, exclusive of final utility connections.

B. Related Work Specified Elsewhere:
   1. All plumbing, electrical and ventilating work required in conjunction with commercial foodservice equipment including rough-in to points indicated on mechanical drawings, and final connections from rough-in points, electrical service to points of connection and final connections shall be by Divisions 22, 23 and 26.
   2. Refrigeration work will be done by the Kitchen Equipment Contractor except for electrical and plumbing connections to and between compressors, blower coils, controls, etc. These final connections shall be by Divisions 22 and 26.
   3. All traps, steam traps, grease traps, line strainers, tail pieces, valves, mixing valves, backflow preventers, stops, shut-offs, and fittings necessary for equipment specified will be furnished and installed under mechanical contract by Division 22 unless specifically called for otherwise under each item.
   4. All line and disconnect switches, safety cut-offs and fittings, convenience boxes or other electrical controls, fittings and connections will be furnished and installed under electrical contract by Division 26, unless specifically indicated otherwise in the item specifications. Starting switches for certain specified pieces of foodservice equipment are to be provided by Kitchen Equipment Contractor. Those starting switches, if furnished loose as standard by Foodservice Manufacturers (other than fabricated items), shall be mounted and wired complete under Division 26.
   5. Any sleeves or conduit required for refrigeration, syrup tubing, or carbonation tubing will be furnished and installed under Division 22.
   6. Unless specifically called for in the Item Specifications, ventilating fans and all duct work between same and ceiling rough-in openings, and from same to discharge opening in building will be furnished and installed by Division 22.

1.02 DEFINITIONS

A. All references to the terms "Contractor", "Kitchen Equipment Contractor", or "K.E.C." in the specifications and/or on the drawings shall be defined to mean the Kitchen Equipment Contractor.

B. All references to the term "Owner" in the specifications and/or on the drawings shall be defined to mean the Owner or Owner's designated representative and the Foodservice Equipment Consultant.
C. All references to the term "Consultant" or "Foodservice Equipment Consultant" in the specifications and/or on the drawings shall be defined to mean NYIKOS ASSOCIATES, INC., its employees, and authorized representatives and is referred to throughout the contract documents as if singular in number and masculine in gender.

D. The phrase "The K.E.C. shall" or "by the K.E.C.", as applicable, is understood to be included as a part of each sentence, paragraph or article of these specifications unless otherwise indicated or specified.

1.03 QUALITY ASSURANCE

A. Qualification of Suppliers:
1. Commercial foodservice equipment suppliers shall submit satisfactory evidence of compliance with the following qualifications and conditions to be approved.
   a) Successful completion of jobs of comparable scope.
   b) Have manufacturer's authorization to distribute and install specified factory items of equipment.
   c) Maintain a permanent staff experienced in the installation of foodservice equipment and preparation of professional style rough-in drawings and brochures.
   d) Maintain or have access to fabrication shop meeting N.S.F. requirements. If other than foodservice equipment suppliers own fabrication shop, obtain Consultant approval of fabrication shop desired to be used.
   e) Maintain or have access to a readily available stock of repair and replacement parts, together with authorized service personnel.

B. Qualification of Fabricators:
1. Fabricators shall be an N.S.F. approved organization with trained personnel and facilities to properly design, detail and fabricate equipment in accordance with the specifications and standard details contained herein.
2. Custom fabricated equipment shall bear the National Sanitation Foundation seal of approval and listed as such under N.S.F. Standards No. 2 and No. 33.
3. Only one (1) fabricator shall be used for this project, and all equipment will be fabricated at the same shop. Where units cannot be fully shop-fabricated, complete fabrication at project site.
4. Acceptable fabricators are:
   a) Pro Stainless, Inc.; Keyser, WV
   b) Commercial Stainless, Inc.; Bloomsburg, PA
   c) Keystone Custom Fabricators, Inc.; Elizabeth, PA
   d) Southern Equipment Fabricators, Inc.; Columbia, SC
   e) Custom Metals of Virginia, Inc.; Manassas, VA
   f) Other fabricators, as approved by Consultant.

C. Qualification of Manufacturers:
1. Manufacturers shall be regularly engaged in the production of items furnished and shall have demonstrated the capability to furnish similar equipment that performs the functions specified or indicated herein.

D. Standard Products:
1. Materials, products, and equipment furnished under this contract shall be the standard items of manufacturers regularly engaged in the production of such materials, products, and equipment and shall be of the manufacturer's latest
design that complies with the specifications which have been produced and used successfully on other projects and in similar applications.

2. Discrepancies within contract documents should immediately be brought to the attention of the Consultant in writing for clarification prior to fabrication or ordering of standard items.

1.04 PLANS & SPECIFICATIONS

A. Specifications and drawings have been prepared to form the basis for procurement, erection, start-up and adjustment of all equipment in this contract. Plans and specifications shall be considered as mutually explanatory and work required by one, but not the other, shall be performed as though required by both. Items required by one, but not by the other shall be provided as though required by both. Work shall be accomplished as called for in specifications and shown on drawings, so that all items of equipment shall be completely functional for purpose for which they were designed. When there is any discrepancy between drawings and specifications, drawings shall govern. Bidders should seek clarification of any discrepancies from the Consultant prior to bidding.

1.05 SUBMITTALS

A. General Requirements:
1. Within six (6) weeks or earlier, as required, assemble and submit all shop drawings, rough-in drawings, brochures, color samples, etc. as a complete package. There will be no review of partial submittals.
2. Any and all costs, to all trades and parties involved, arising from delay of project due to non-submittal of the complete package by the K.E.C. within a reasonable time period shall be borne solely by the K.E.C.
3. Identify each submittal by project name, date, contractor, submittal name, and any other necessary information to distinguish it from other submittals.

B. Shop Drawings:
1. Submit shop drawings electronically in PDF format, drawn on sheets equal in size to Contract Documents of equipment specified for custom fabrication including all accessories attached to each item.
2. Drawings shall be detailed and fully dimensioned to a minimum scale of 3/4"=1'-0" for plan and elevation views, and 1-1/2"=1'-0" for sections, based on the floor plan(s) and following item specifications. Drawings will be checked for thoroughness, accuracy, completeness, neatness, and returned for corrections, if necessary.

C. Rough-in Drawings:
1. Submit rough-in drawings electronically in PDF format, drawn on sheets equal in size to Contract Documents of detailed arrangement plans professionally prepared from architects dimensioned plans (not traced from Contract Documents) at a minimum scale of 1/4"=1'-0".
2. Equipment Layout Plan showing arrangement of all items specified and identified on schedule of equipment listing item number, description, quantity, manufacturer, model number, and remarks.
3. Ventilation Plan showing dimensioned locations of all duct openings for ventilators and dishmachines identifying size, c.f.m. required (exhaust and supply), static pressures, and connection heights.
4. Plumbing/Electrical Plans showing dimensioned locations, sizes, elevations and capacities of all utility services required for each item of equipment in relation to finished walls, columns, and heights above finished floor.
5. Special Conditions Plan showing exact dimensions and details of all masonry bases, floor depressions, critical partition locations/heights, wall openings, reinforcing for wall and/or ceiling mounted equipment, and conduit locations for soda and compressed gas lines.

D. Equipment Brochures:
1. Submit electronic files in PDF format of manufacturer's illustrations and technical data for approval prior to procurement. All items of Standard Manufacture shall be submitted, including items purchased to be built into fabricated equipment. Each illustration shall be marked to accurately describe the item to be furnished as specified. Include all deviations from standard information (i.e., voltage, phase, load, etc.).
2. Include a separate information sheet ahead of each illustration sheet showing all service connection sizes, electrical requirements, loads, consumptions, and all accessories specified.
3. Manufacturer's suggested schematic drawings for connection of mechanical and electrical services for such items as booster heaters, disposers, or any other item of equipment that may require the same.

E. Miscellaneous Shop Drawings:
1. Submit electronic files in PDF format of manufactured equipment specified requiring clarification and approval such as, walk-in cooler/freezer drawings, ventilator drawings, utility raceway drawings, and refrigeration system drawings.

F. Operation and Maintenance Manuals:
1. Submit electronic files in PDF format of all mechanically operated equipment of standard manufacture. Include operating and cleaning/maintenance instructions, parts listing, recommended parts inventory listing and purchase source, copy of warranties, and similar applicable information.
2. Brochure covers shall bear the job name, date, and name of contractor.

G. Manufacturer's List:
1. The K.E.C. shall submit electronic files in PDF format a list of all manufacturer's representatives of the food service equipment such as convection ovens, ranges, etc., and their authorized service agencies' addresses and telephone numbers; to be presented after submission of manufacture data.

H. Samples:
1. Samples of materials, products, and fabrication methods, shall be submitted for approval upon request at no additional cost, before proceeding with work.

I. Re-submission Requirements:
1. Shop Drawings:
a) Revise initial drawings as required and resubmit in accordance with submittal procedures.
b) Indicate on drawings all changes which have been made in addition to those requested by Consultant.
2. Product Data and Samples:
a) Submit new data and samples as required for initial submittal.
b) Make all re-submittals within fourteen (14) working days from date of Consultants previous action.

J. Approvals:
1. After approval of the submittals listed above, furnish as many prints and copies as are required for the various trades, the Owner, the Architect, and the Consultant.
2. The approval of the shop drawings will be general and shall not relieve the K.E.C. of responsibility for proper fitting, finishing, quantities, and erection of work in strict accordance with the contract requirements, nor does it relieve him of the responsibility of furnishing material and workmanship not indicated on approved shop drawings but required for the completion of his work.
3. Approval by the Consultant and/or Owner of the manufacturer's data submitted by the K.E.C. does not waive the responsibility of K.E.C. to furnish each item of equipment in complete compliance with the specifications and drawings. Discrepancies between Contract Documents and furnished equipment shall be corrected even after approval and installation of this equipment at no additional cost to the Owner.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery:
1. Equipment shall be delivered to the job site only after the building is weather-safe and vandal-safe.

B. Storage:
1. Store equipment in an area convenient to the point of installation in such a way that it can be protected from the weather and job hazards.

C. Protection:
1. Wrapping and protective coatings shall remain on all items until ready for use and in the case of stainless steel items, until installation is complete and the job is ready for cleaning.

D. Damage:
1. All responsibility shall rest with the K.E.C. for any damage or loss incurred prior to final acceptance. Such items as may be lost or damaged shall immediately be replaced or repaired to a new condition to the complete satisfaction of and at no additional cost to the Owner.

1.07 JURISDICTION TRADE AGREEMENTS AND RESTRICTIONS

A. Include the work specified, shown or reasonably inferable as part of foodservice equipment. Portions of this work may be subcontracted to those qualified to do such work, as may be necessary because of jurisdictional trade agreements and restrictions.

1.08 REGULATIONS AND CODES

A. Except as otherwise indicated, each item of equipment shall comply with the latest current edition of the following standards as applicable to the manufacture, fabrication, and installation of the work in this section.
1.09 Warranties

A. Warrantee in writing all equipment and fabrication against defects and workmanship for a period of two (2) year from date of acceptance.
1. Each piece of mechanical equipment shall be listed, together with the authorized service and repair agency whom the Owner will call should malfunctions occur within the two-year (2) guarantee period.

B. Refrigeration system compressors shall be warranted for five (5) years by the manufacturer. Free refrigeration service, including parts and labor, shall be furnished for two (2) years from date of acceptance.

1.10 Job Conditions

A. Visit the job site to field check actual wall dimensions and roughing-in and shall be responsible for fabricating and installing the equipment in accordance with the available space and utility services as they exist on the job site.

B. Check all door openings, passageways, elevators, etc., to be sure that the equipment can be conveyed to its proper location within the building and if necessary, check the possibility of holding wall erection, placement of doorjambs, windows, etc. for the purpose of moving the equipment to its proper location with the Contractor. Any removal and rebuilding of walls, partitions, doorjambs, etc. necessary to place the
equipment, or if caused by incorrect information on the Contractor's drawings, shall be done at the expense of the K.E.C., at no additional cost to the Owner.

C. Notify the Consultant and Owner before fabrication of equipment of any discrepancies between plans and specifications and actual conditions on the job.

D. Before finished floors, walls, and/or ceilings are in place, physically check the location of all "rough-ins" at the job site. Report discrepancies in writing.

E. Any changes required after fabrication has been started to ensure equipment accurately fitting the space as it exists and conforming to actual field dimensions on the job shall be made at no additional cost to the Owner.

F. If special hoisting equipment and operators are required, include such cost as part of the bid for this work.

1.11 EXISTING EQUIPMENT

A. Re-Use and Relocation of Existing Equipment
   1) Dis-assemble, clean, repair, move, re-assemble and re-set listed existing items in new location as shown on plan.
   2) Provide necessary hoisting apparatus as required to safely and effectively transport items to new location. Include wrapping or padding of sensitive items to protect against scratching or denting.
   3) Any damages incurred as a result of the relocating of equipment shall be repaired by competent service agency to like-new condition with no additional cost to the contract price.

B. Cleaning and Repair
   1) The Equipment Contractor shall clean listed existing items and replace any defective parts.
   2) Cleaning shall consist of the removal of residues of food, ingredients, dirt and all other soiling materials and extraneous matter.
   3) Repairs and parts shall be for minor items such as: control knobs, pilot lamps, faucet washers, minor adjustments, etc.
   4) Major repairs or parts required, which are only detectable during repairs, shall be noted in writing, with cost, to Owner for approval and addition to the contract price.

C. Storage and Protection
   1) Coordinate a suitable location within the building to store all existing equipment. Otherwise, provide secured on-site storage in the form of a trailer or shed.
   2) Should on-site storage not be available, transport equipment to supplier's warehouse.
   3) K.E.C. shall be responsible for protection from theft and damage of all existing equipment scheduled for re-use.

1.12 CHANGES IN THE WORK

A. The Owner reserves the right to require reasonable modification to be made in the routing of work and relocation of equipment. This specifically refers to conditions where interference occurs or where more desirable accessibility can be obtained or
whose materials cannot be installed because of structural or mechanical conditions encountered. Such changes shall be made at no additional cost to the Owner.

1.13 PATENTS

A. Hold harmless and save the Owner and its officers, consultants, servants and employees from liability of any nature or kind, including costs and expenses for or on account of any copyrighted, patented, or un-patented invention, process, trademark, design, device, material, article, or appliance manufactured or used in the performance of the contract, including its use by the Owner, unless otherwise specifically stipulated in the Contract Documents.

B. If the Contractor has information that the process or article specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Owner in writing. The contract price shall include all royalties or costs arising from the use of any or all of the above which are, in any way, involved in the contract.

1.14 CONTRACTOR'S WARRANTY

A. The Contractor represents and warrants:

1. That he is financially solvent and that he is experienced in and competent to perform the types of work or to furnish the plans, materials, supplies or equipment, to be so performed or furnished by him.

2. That he is familiar with all Federal, State, municipal, and department laws, ordinances, orders, and regulations, which may, in any way, affect the work of those employed therein, including, but not limited to, any special acts relating to the work or to the project of which it is a part.

3. That such temporary and permanent work required by the contract as is to be done by him can be satisfactorily constructed and used for the purpose for which it is intended and that such construction will not injure any person or damage any property.

4. That he has carefully examined the plans, specifications, addenda, if any, and the site of the work and that, from his own investigations, he has satisfied himself as to the nature and location of the work, the character, quality, and quantity of materials likely to be encountered, the character of equipment and other facilities needed for the performance of the work, the general and local conditions, and all other materials which may, in any way, affect the work or its performance.

5. That he has satisfied himself as to the existing openings and accesses to the foodservice area through which his equipment shall be required to pass and that he is responsible for his equipment being delivered in as many sections as necessary to conform to the available space dictated by these existing limitations.

1.15 SUBSTITUTIONS

A. Bids submitted shall be for the specific manufacturer and model, size, capacity, and accessories, as specified or shown on the drawings.

B. The K.E.C. may quote upon brands and models of equipment other than those specified as a substitute, but he must also bid the primary item. In the event that it is desired to request approval of substitute material, product, article, process, or item of equipment in lieu of which is specified, submit a written request at the time of submitting bid on
a separate sheet attached to, but not part of, the base bid, setting forth the proposed substitution in detail, including an itemized analysis of the addition or deduction in the amount of the contract, if any, which will result if the substitution is approved. Each such request shall include a complete description of the proposed substitute, the name of the material or equipment for which it is to be substituted, drawings, cuts, performance and test data and any other data or information necessary for a complete evaluation.

C. The Contractor shall be held responsible for additional costs to himself or any other prime contractor for changes required to install materials, devices, equipment, etc., which the Contractor has substituted for that specified.

D. The Owner reserves the right to award a contract or contracts based upon the inclusion or exclusion of one or more of the alternate estimates. The description of all workmanship and materials under the various headings of the specifications shall have the same meaning and force when applied to similar workmanship and materials in the alternate. If the descriptions are not specific, the workmanship shall be the best quality and the materials the best commercial grade.

E. Whenever any product is specified in the Contract Documents by reference to the name, trade name, make, or catalog number of any manufacturer or supplier, the intent is not to limit competition but to establish a standard of quality which is necessary for the project. Products of other manufacturers meeting the established criteria will be considered. However, please take note that the plumbing, electrical, steam, heating, ventilating, and air-conditioning drawings prepared by the consulting engineers, have been engineered based on the first product named under each item number designation. Therefore, any other product which is submitted for approval in lieu of the primary item specified, shall conform to the rough-in requirements established for the first product named, as well as physical size and building construction requirements.

F. Any equipment listed, which is not in accordance with the provisions of these specifications, will be rejected. If the Contractor fails to submit for approval within the specified time the list of equipment as required herein, the Consultant shall then have the right to make the final equipment selection. The selection made by the Consultant shall strictly conform to these specifications and will be final and binding, and the items shall be furnished and installed by the Contractor without change in the contract price at the time of completion.

G. It shall be the responsibility of the K.E.C. to prove that substitutions are equal to specified items. NYIKOS ASSOCIATES, INC. as the Owner's representative, shall be the determining authority as to the acceptability or equality of the substitutions. No substitutions shall be approved after bids are received.

1.16 DESIGN/MODEL CHANGE, DISCONTINUED ITEMS

A. All equipment specified shall be of latest design. Any improvements made in design and construction of prefabricated items before equipment is actually delivered to the project site, shall be incorporated in equipment, at no additional cost, provided such incorporation does not delay delivery date of equipment.

B. In the event of an item being discontinued after specified and prior to delivery to project site, the K.E.C. shall be responsible for notifying the Consultant in writing of the
discontinued item and request an alternate of equal performance, including all accessories, at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 GENERAL

A. The equipment and its component parts shall be new and unused. All items of standard manufactured equipment shall be current models at the time of delivery. All parts subject to wear, breakage, or distortion shall be accessible for adjustment, replacement, and repair.

B. Means shall be provided to ensure adequate lubrication for all moving parts. All oil holes, grease fittings, and filler caps shall be accessible without the use of tools.

C. The design of the equipment shall be such as to provide for safe and convenient operation. Covers or other safety devices shall be provided for all items of equipment presenting safety hazards. Such guards or safety devices shall not present substantial interference to the operation of the equipment. All guards shall provide easy access to the guarded parts.

D. Trim shall not be an acceptable substitute for accuracy and neatness. When trim is required and accepted by the Consultant and the Owner in lieu of rejection of items of equipment, it shall be the K.E.C.'s responsibility to provide same at no additional cost.

E. Unless otherwise specified herein, no material lighter than #20 gauge shall be incorporated into the work. All gauges for sheet iron and sheet steel shall be U.S. Standard Gauges, and finished equipment gauge thickness shall not vary more than 5% plus or minus from the thickness indicated below.

<table>
<thead>
<tr>
<th>GAUGE</th>
<th>THICKNESS</th>
<th>GAUGE</th>
<th>THICKNESS</th>
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</thead>
<tbody>
<tr>
<td>#10</td>
<td>0.1406</td>
<td>#16</td>
<td>0.0625</td>
</tr>
<tr>
<td>#12</td>
<td>0.1094</td>
<td>#18</td>
<td>0.0500</td>
</tr>
<tr>
<td>#14</td>
<td>0.0781</td>
<td>#20</td>
<td>0.0375</td>
</tr>
</tbody>
</table>

F. Materials or work described in words which have a well known and acceptable trade meaning shall be held to refer to such accepted meanings.

2.02 MATERIALS

A. Refrigeration Systems:
   1. Self-contained:
      a) Whether the units be top-mounted or cabinet-mounted, they shall be started by the K.E.C. and shall be tested for maintenance of temperature.
      b) All units shall be furnished with condensate evaporators.
   2. Remote: Provide and install complete refrigeration system(s), charged, started, and operating properly, according to the Item Specifications and the following.
      a) Single stage compressors with air-cooled condensers operating within the recommended range of suction discharge pressure of economical operation and within the required capacity.
      b) All units shall be new and factory assembled, to operate with the refrigerant specified. Refrigerant R-404A shall be used for all medium and
low temperature applications. Due to the unsettled nature of refrigerants, no refrigerant shall be used with a phase-out date of less than ten (10) years from the date of installation.

c) Compressors shall be accessible hermetic type, Copeland or approved equal, and shall be equipped with high-low pressure control, liquid line drier, sight glass, suction and discharge vibration eliminator, and head pressure control.

d) The system shall have a factory mounted and pre-wired control panel complete with main fused disconnect, compressor circuit breakers, contactors, and time clocks wired for single point power connection.

e) The supporting frame shall be constructed of structural steel, fully welded, and protected against rust and corrosion with one (1) coat primer, and two (2) coats paint, unless otherwise specified.

f) Systems specified for outdoor installation shall be fully protected in a weather-proofed housing with louvered front panel and hinged top, constructed to resist rust and corrosion, and furnished with low ambient controls. Crankcase heater shall be provided with every compressor.

3. Where specifications call for pre-piped lines (i.e., from a fixture to a valve compartment, etc.), provide such work in strict conformance with other sections of the specifications which set forth standards for this type of work or in conformity with the requirements of the Board of Fire Underwriters or ASHRAE Standards, whichever is greater.

4. Each refrigeration item specification is written to provide minimum specifications and scope of work. All refrigeration equipment shall be designed and installed to maintain the following general temperatures unless otherwise specified.

<table>
<thead>
<tr>
<th>TYPE</th>
<th>REFRIGERATORS</th>
<th>FREEZERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Walk-In</td>
<td>+35º F./1.7º C.</td>
<td>-10º F./-23.3º C.</td>
</tr>
<tr>
<td>b. Reach-In</td>
<td>+35º F./1.7º C.</td>
<td>+10º F./-23.3º C.</td>
</tr>
<tr>
<td>c. Undercounter</td>
<td>+35º F./1.7º C.</td>
<td>+10º F./-23.3º C.</td>
</tr>
<tr>
<td>d. Fabricated</td>
<td>+35º F./1.7º C.</td>
<td>+10º F./-23.3º C.</td>
</tr>
<tr>
<td>e. Cold Pans</td>
<td>+0º F./-17.8º C.</td>
<td></td>
</tr>
<tr>
<td>f. Work Rooms</td>
<td>+50º F./10º C.</td>
<td></td>
</tr>
</tbody>
</table>

5. Provide (including payment if subcontracted) all electrical and refrigeration components needed by the completed system and complete (or have completed by the respective trades) all connections of and to said components.

6. An evaporator coil defrost system shall be provided and installed by the K.E.C. on all refrigeration systems designed to operate at an evaporator coil temperature of less than +35º F. Evaporator coil units provided without electric defrost feature shall be installed with a solenoid valve in the liquid line, controlled by the time clock so as to shut off the flow of refrigerant and allow the compressor to pump down and shut off by activation of the pressure control switch.

7. Verify the requirements of and provide any or all additional refrigeration specialty(s) or component(s) required or recommended by the manufacturer for proper operation under the specific operating conditions and location of each system specified.

8. Verify and provide manufacturer's certification that the equipment selection hereinafter specified for each refrigeration system is properly sized and shall meet the operating requirements set forth for each system regarding maintaining
specified operating temperature, hours of compressor running time, and system pressures and velocities as recommended by the equipment manufacturer(s).

9. All refrigeration systems shall be installed and wired in strict conformance with the manufacturer's instructions and recommendations.

B. Motors and Heating Elements:
   1. Motors up to and including 1/2 HP shall be wired for 120 volt, single phase service. Motors larger than 1/2 HP shall be wired for 208 volt, single or three phase service as indicated. Motors shall be of the drip-proof, splash-proof, or totally enclosed type, having a continuous duty cycle and ball bearings, except small timing motors which may have sleeve bearings. All motors shall have windings impregnated to resist moisture. Motors located where subject to deposits of dust, lint, or other similar matter shall be of the totally enclosed type. Motors shall have ample power to operate the machines for which designated under full load operating conditions without exceeding their nameplate ratings. Insulation shall be N.E.M.A. Class B or better.

   2. Heating elements having a connected load up to and including 1,000 watts shall be wired for 120 or 208 volt, single phase service, or as indicated on the drawings.
      a) Any heating element larger than 1,000 watts or any combination of elements in one fixture totaling more than 1,000 watts shall be wired for 208 volt single or three phase service, as indicated on the drawings.
      b) Fixtures having multiple heating elements may be wired for three phase service with the load balanced as equally as possible within the fixture.

C. Switches and Controls:
   1. Provide recognized commercial grade signals, "on-off" pushbuttons or switches, and other speed and temperature controls as required for operation of each item, complete with pilot lights and permanent graphics, conspicuously labeled, to assist the user of each item.

   2. Mount switches and controls directly adjacent the piece of equipment for which it involves, on operator's side of counter body apron, out of view to the public.

   3. Provide on or for each motor-driven appliance or electrical heating or control unit, a suitable control switch or starter of the proper type and rating and in accordance with Underwriter's Code wherever such equipment is not built in. All other line switches, safety cut-outs, control panels, fuse boxes, other control fittings and connections, when not an integral part of the unit or furnished loose by the manufacturer will be furnished and installed by the Electrical Contractor, unless otherwise specified. All electrical controls, switches, or devices provided loose for field installation as a part of the item specified shall be installed in the field by the Contractor unless otherwise specified.

   4. Appliances shall be furnished complete with motors, driving mechanisms, starters, and controllers, including master switches, timers, cut-outs, reversing mechanisms, and other electrical equipment if and as applicable.

D. Cover Plates:
   1. All controls mounted on vertical surfaces of fixtures shall be set into recessed die stamped stainless steel cups, or mounted onto removable cover plates in such a fashion as to not protrude or interfere with the operation of each item.

   2. Cover plates shall be furnished and installed for all electrical outlets, receptacles, switches and controls furnished by the K.E.C., and shall match the material and finish of the equipment to which they will be fastened.
E. Wiring and Conduit:
1. Wiring shall be properly protected in N.E.M.A. and U.L. approved metal enclosures. Only rigid steel conduit shall be used, zinc coated where unexposed and chrome plated where exposed. All wiring shall be run concealed wherever possible.
2. All equipment furnished under this contract shall be so wired, wound, or constructed so as to conform with the electrical characteristics at the job site.
3. Wiring and connection diagrams shall be furnished with electrically operated machines and for all electrically wired fabricated equipment.
4. Furnish all foodservice equipment completely wired internally using wire and conduit suitable for a wet location. Where an Electrician's services are required, the work shall be done in the K.E.C.'s factory or at his expense at the job site at no additional cost to the Owner. Provide all electrical outlets and receptacles required to be mounted on or in fabricated equipment and interconnect to a master circuit breaker panel with all wires neatly tagged showing item number, voltage characteristics, and load information. Final connection shall be made by the Electrical Contractor.

F. Cords, Plugs, and Receptacles:
1. The Electrical Contractor shall provide three- or four-wire, grounding-type receptacles for all wall and floor mounted outlets to be used for plug-in equipment with characteristics as noted on the drawings. Provide "Hubbell" three-wire or four-wire grounding-type connectors and neoprene cords installed on each item of plug-in equipment, as indicated on drawings and item specifications.
2. K.E.C. shall coordinate with the Electrical Contractor so that the receptacles provided will match the specific plugs provided as part of the plug-in equipment. Any changes in cords and plugs required in the field due to lack of coordination between the Electrical Contractor and the K.E.C. shall be the latter's responsibility.
3. Reduce the length of all cords furnished with the specified equipment to a suitable or appropriate length so they do not interfere with other equipment or operations.
4. Pedestal receptacles that are part of fabricated equipment exposed to view, shall be similar to T&S Model No. B-1508DD single face, single gang or Model No. B-1528DD single face, double gang.

G. Water Inlets:
1. Water inlets shall be located above the positive water level wherever possible to prevent siphoning of liquids into the water supply system. Wherever conditions shall require a submerged inlet, a suitable type of check valve (except in jurisdictions where check valves are prohibited) and vacuum breaker shall be placed on the fixture to form a part of same to prevent siphoning. Where exposed to view, piping and fittings shall be chrome-plated.

H. Drain Lines:
1. Plumbing Contractor shall provide and install indirect waste lines from equipment which will discharge into floor drains or safe wastes in accordance with Plumbing Rough-In Plans, chrome-plated where exposed. Extend to a point at least 1" (or as required by local codes) above the rim of the floor drain, cut bottom on 45E angle and secure in position.
2. All horizontal piping lines shall be run at the highest possible elevation and not less than 6" above finished floor, through equipment where possible.
3. No exposed piping in or around fixtures or in other conspicuous places shall show tool marks of more than one thread at the fitting.
4. All steam operating valves on or in fabricated and purchased foodservice equipment shall be provided with composition hand wheels, which shall remain reasonably cool in service.
5. Provide suitable pressure regulating valves for all equipment with such components that might reasonably be expected to be affected over a period of time by adverse pressure conditions.

I. Faucets, Valves and Fittings:
1. All sinks shall be fitted with chromium plated, swing spout faucets of same manufacturer throughout as follows, or otherwise specified in Item Specifications.
   a) Prep and Utility Sinks:
      1) Splash-Mounted:
         a) T&S Brass and Bronze Works, Inc., Model B-231.
         b) Fisher Manufacturing Company, Model 3253.
      2) Deck-Mounted:
         a) T&S Brass and Bronze Works, Inc., Model B-221.
         b) Fisher Manufacturing Company, Model 3313.
   b) Pot Sinks:
      1) Splash-Mounted:
         a) T&S Brass and Bronze Works, Inc., Model B-290.
         b) Fisher Manufacturing Company, Model 5214.

2. Pre-Rinse Assemblies:
   a) Splash-Mounted:
      1) T&S Brass and Bronze Works, Inc., Model B-133 with B-109 wall bracket.
      2) Fisher Manufacturing Company, Model 2210 with 2902-12 wall bracket.
   b) Deck-Mounted:
      1) T&S Brass and Bronze Works, Inc., Model B-143 with B-510 mixing valve and B-109 wall bracket.
      2) Fisher Manufacturing Company, Model 2810 with 2805-CV mixing valve and 2902-12 wall bracket.

3. Vacuum Breakers:
   a) General Use:
   b) Disposers:
      1) Splash-Mounted:
         a) T&S Brass and Bronze Works, Inc., Model B-455.
         b) Fisher Manufacturing Company, Model 3990.
      2) Deck-Mounted:
         a) T&S Brass and Bronze Works, Inc., Model B-456.
         b) Fisher Manufacturing Company, Model 3991.

4. Trough Inlets:
   a) Fisher Manufacturing Company, Model No. 2905.

5. Other specialty faucets, pre-rinse assemblies, vacuum breakers, and trough inlets, as specified under Item Specifications.
6. All sink compartments shall be fitted with 2" NPT male, chrome-plated, brass rotary waste valves complete with overflow assemblies and stainless steel strainers.
   a) Prep and General Utility Sinks:
      1) Fisher Manufacturing Company, Model No. 6100.
   b) Pot Sinks:
      1) Fisher Manufacturing Company, Model No. 6102.
7. Refer to Division 22 for all other fittings.

J. Metals and Alloys:
1. Stainless steel sheets shall conform to ASTM 240, Type 302, Condition A, 18-8, of U.S. Standard Gauges as previously indicated under paragraph 2.1.E.
   a) All exposed surfaces shall have a No. 4 finish. A No. 2B finish shall be acceptable on surfaces of equipment not exposed to view.
   b) All sheets shall be uniform throughout in color, finish, and appearance.
   c) Rolled shapes shall be of cold rolled type conforming to ASTM A36.
2. Stainless steel tubing and pipe shall be Type 304, 18-8, having a No. 4 finish, and shall conform to either ASTM A213 if seamless or ASTM A249 if welded.
3. Where galvanized metal is specified, it shall be copper-bearing galvanized iron, cold-rolled, stretcher leveled, bonderized, re-rolled to insure a smooth surface, and used in the largest possible sizes with as few joints as necessary.
4. Galvanizing shall be applied to rolled shapes in conformance with ASTM A123, and to sheets in conformance with ASTM A526, coating designation G-90.

K. Castings:
1. Castings shall consist of corrosion resisting metal (white metal) containing not less than 30% nickel. All castings shall be rough ground, polished, and buffed to bright lustre and free from pit marks, runs, checks, burrs, and other imperfections. In lieu of corrosion resisting metal castings, die-stamped or cast 18-8 stainless steel will be acceptable.

L. Hardware and Casters:
1. All hardware shall be of heavy-duty type, satin finished chromium plated brass, cast or forged or highlighted stainless steel of uniform design. All hardware shall be a well-known brand, and shall be identified by the manufacturer's name and model number for easy replacement of broken or worn parts.
2. Casters on custom-built equipment shall be heavy-duty type, ball bearing, solid or disc wheel, with grease-proof rubber, neoprene, or polyurethane tire. Wheel shall be 5" diameter, minimum width of tread 1-3/16", minimum capacity per caster 250 pounds, unless otherwise noted.
   a) Solid material wheels are to be provided with stainless steel rotating wheel guard.
   b) All casters shall have sealed wheel and swivel bearings, polished plated finish and be N.S.F. approved.
   c) All equipment specified with casters shall have a minimum of two (2) with brakes installed on opposite corners, unless otherwise noted.

M. Locks:
1. When specified, doors and drawers of all custom fabricated or manufactured equipment shall be provided with cylinder locks, disc tumbler type with stainless steel faceplate as manufactured by Standard-Keil Mfg. Co., or approved equal.
   a) Provide two (2) sets of keys for each lock.

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PE Project 72641.00.0 November 4, 2019
b) All locks shall be keyed alike, except at cashiers stations or unless otherwise specified.

N. Thermometers:
1. All fabricated refrigerated compartments shall be fitted with exterior mounted, adjustable, dial or digital thermometers with flush bezels, and shall be calibrated after installation.

O. Sealants:
1. Sealant, wherever required, shall conform to ASTM C 920; Type S Grade NS, Class 25, Use Nt, with characteristics that when fully cured and washed meets requirements of Food and Drug Administration Regulation 21 CFR 177.2600 and N.S.F. RTV-732 for use in areas where it comes in contact with food.
2. Dow-Corning #780 or General Electric "Silastic", or approved equal, in either clear or approved color to match surrounding surfaces and applied in accordance with sealant manufacturers recommendations for a smooth, sealed finish.

P. Millwork:
1. All millwork materials shall be free from defects impairing strength, durability, or appearance; straight and free from warpage; and of the best grade for their particular function. All wood shall be well seasoned, kiln dried, and shall have an average moisture content of 8%, a max. of 10% and a min. of 5%.
2. Plywood and other woodwork of treatable species, where so required by code, shall be fire-retardant treated to result in a flame spread rating of 25 or less with no evidence of significant progressive combustion when tested for 30 minutes duration under ASTM E84 and shall bear the testing laboratory mark on the surface to be concealed.
3. Concealed softwood or hardwood lumber shall be of poplar, douglas fir, basswood, red oak, birch, maple, beech or other stable wood and shall be select or better grade, unselected for color and grain, surfaced four sides, square-edged, and straight. Basswood may be used where fire-retardant materials are required.
4. Plywood for transparent finish shall conform to U.S. Product Standard PS-51-71, Type I (fully waterproofed bond), with architectural grade face veneers of species as specified, free of all pin knots, patches, color streaks and spots, sapwood, and other defects. Plywood designated to have plywood cores shall be of either 5 or 7 ply construction. Plywood so designated on the drawings and plywood not otherwise shown shall have a particle board core, cross banding of veneers, and face and back veneers. Particle board cores shall have a 45 pound density, except where the fire retardant treatment requires cores of lesser density.
5. Face veneers shall be matched for color and grain to produce balance and continuity of character. Mineral streaks and other discolorations, worm holes, ruptured grain, loose texture, doze, or shake will not be permitted. Face veneer leaves on each surface shall be full-length, book-matched, center-matched, and sequence-matched. Surfaces shall be sequence and blueprint matched. Veneers not otherwise indicated shall be plain sliced. Backing veneers for concealed surfaces shall be of a species and thickness to balance the pull of the face veneers.
6. Hardwood plywood for painted surfaces shall conform to U.S. Product Standard PS-51-71, Type I, and shall have sound birch, maple or other approved close grain hardwood faces suitable for a paint finish.
7. Perforated hardboard shall be a tempered hardboard, 1/4" thick, conforming to Federal Specification LLL-B-810B, Type I, SIS, Finish B (primed), Design B (perforated), with 1/4" diameter holes spaced on 1" centers both ways.

8. Plywood for laminate assemblies shown or specified with plywood core shall be of the 5 or 7 ply construction with sanded close-grain hardwood face and back veneers, laminated with waterproof glue, in thickness shown, conforming to U.S. Product Standard PS-51-71.

9. Particle board for plastic laminate assemblies shown or specified with particle board wood core shall conform to U.S. Product Standard CS-236-66, Type 1, or 2, Grade B (45 pound density), class 2: except where fire-retardant treatment is required the density shall conform to the treatment requirements.

Q. Plastic Laminate:
1. Plastic laminate surfaces shall be laminated with thermosetting decorative sheets of the color, pattern, and style as selected by the Architect.
   a) Horizontal surfaces shall be laminated with sheets conforming to Federal Specification L-P-508F, Style D, Type I (general purpose), Grade HP, Class 1, 1/16" thick, satin finish, with rough sanded backs.
   b) Vertical surfaces shall be laminated with sheets conforming to Federal Specification L-P-598F, Style D, Type II, (vertical Surface), Grade HP, Class 1, non-forming, satin finish, 1/32" thick or heavier.
   c) Curved surfaces shall be laminated from sheets conforming to Federal Specification L-P-508F, Style D, Type III (post-forming), Grade HP, Class 1, satin finish.
   d) Balance sheets for backs in concealed locations shall be either reject material of the same type and thickness as the general purpose grade facing or may be .020" thick laminate backing sheets conforming to Federal Specification L-P-00508E, Style ND, Type V (backing sheet), Grade HP.

2. Adhesives:
   a) For application of plastic laminate to wood substrates of horizontal surfaces shall be a phenolic, resorcinol, or melamine adhesive conforming to Federal Specification MMM-A-181C, producing a waterproof bond.
   b) For applying plastic laminate to vertical surfaces shall be either a waterproof type or a water-resistant type such as a modified urea-formaldehyde resin liquid glue conforming to Federal Specification MMM-A-188C.
   c) Contact adhesive will not be acceptable.

2.03 FABRICATION AND MANUFACTURE

A. Materials and Workmanship:
1. Unless otherwise specified or shown on drawings, all materials shall be new, of best quality, perfect, and without flaws. Material shall be delivered and maintained on the job in an undamaged condition.
2. Fabrication shall be equal to the standards of manufacture used by all first class equipment manufacturers, performed by qualified, efficient, and skilled mechanics of the trades involved.
3. All items of standard equipment shall be the latest model at time of delivery.
4. All fabricated work shall be the product of one manufacturer of uniform design and finish.
5. Each fabricated item of equipment shall include all necessary reinforcing, bracing, and welding with the proper number and spacing of uprights and cross members for strength.

6. Wherever standard sheet sizes will permit, the tops of all tables, shelves, exterior panels of cabinet type fixtures, and all doors and drainboards shall be constructed of a single sheet of metal.

7. Except where required to be removable, all flat surfaces shall be secured to vertical and horizontal bracing members by welding or other approved means to eliminate all buckle, warp, rattle, and wobble. All equipment not braced in a rigid manner and which is subject to rattle and wobble shall be unacceptable, and the K.E.C. shall add additional bracing in an approved manner to achieve acceptance.

B. Sanitary Construction:
1. All fabricated equipment shall be constructed in strict compliance with the standards of the National Sanitation Foundation as outlined in their Bulletin on Food Service Equipment entitled "Standard No. 2" dated October 1952, and in compliance with the local and State Public Health Regulations in which the installation will occur.

2. All fabricated equipment shall bear the N.S.F. "Seal of Approval".

C. Construction Methods:
1. Welding:
   a) All welding shall be the heliarc method with welding rod of the same composition as the sheets or parts welded. Welds shall be complete, strong, and ductile with excess metal ground off and joints finished smooth to match adjoining surfaces; free of mechanical imperfections such as gas holes, pits, cracks, etc., and shall be continuously welded so that the fixtures shall appear as one-piece construction. Butt welds made by spot solder and finished by grinding shall not be acceptable.
   b) Spot welds shall have a maximum spacing of 3". Tack welds shall be of at least 1/4" length, and spaced no greater than 4" from center to center. Weld spacing at the ends of the channel battens shall not exceed 2" centers.
   c) In no case shall soldering be considered as a replacement for welding, nor shall any soldering operation be done where dependence is placed on stability and strength of the joint.
   d) Fixtures shall be shop fabricated of one piece and shipped to the job completely assembled wherever possible. Equipment too large to transport or enter the building in one piece shall be constructed so that the field joints can be welded at the job site.
   e) All exposed joints shall be ground flush with adjoining material and finished to harmonize therewith. Whenever material has been sunk or depressed by welding operation, depression shall be suitably hammered and peened flush with the adjoining surface and ground to eliminate low spots. In all cases the grain of rough grinding shall be removed by successive fine polishing operations.
   f) All unexposed welded joints on undershelves of tables or counters of stainless steel shall be suitably coated at the factory with an approved metallic-based paint.
g) After galvanized steel members have been welded, all welds and areas where galvanizing has been damaged shall have a zinc dust coating applied in conformance with Military Specification Number MIL-P-26915.

2. Joints:
   a) Butt joints and contact joints, wherever they occur, shall be close fitting and shall not require a filler. Wherever break bends occur, they shall be free of undue extrudance and shall not be flaky, scaly, or cracked in appearance; where such breaks do mar the uniform surface appearance of the material, all such marks shall be removed by suitable grinding, polishing, and finishing. Wherever sheared edges occur, they shall be free of burrs, fins, and irregular projections and shall be finished to obviate all danger of laceration when the hand is drawn over them. In no case shall overlapping materials be acceptable where miters or bullnosed edges occur.

   b) Field welded joints shall be ground smooth without dips and irregularities and finished to match original finish.

3. Bolt, Screw and Rivet Construction:
   a) All exposed surfaces shall be free from bolt and screw heads. When bolts are required, they shall be of the concealed type and be of similar composition as the metal to which they are applied.

   b) Where bolt or screw threads on the interior of fixtures are visible or may come into contact with hands or wiping cloths, they shall be capped with a stainless steel or chrome acorn nut and stainless steel lock washer.

   c) If rivets are used to fasten rear paneling to the body of the fixture, such rivets shall be stainless steel. In no case shall iron rivets be used.

4. Sound Deadening:
   a) Schnee Butyl-Sealant 1/2" wide rope continuously between all frame members and underside of stainless steel table tops, overselves and undershelves.

   b) Tighten stud bolts for maximum compression of sealant.

5. Hi-Liting:
   a) All horizontal edges of stainless steel tops, splashes, tops of raised rolled rims, and edges of all exposed doors, handles and shelf edges shall be hi-lited, in uniform design by grinding with abrasive not coarser than #240 grit, then polishing with compound to a uniform mirror finish.

6. Polishing:
   a) The grain of polishing shall run in the same direction on all horizontal and on all vertical surfaces of each item of fabricated equipment except in the case where the finish of the horizontal sections of each shall terminate in a mitered edge.

   b) Where sinks and adjacent drainboards are equipped with backsplash, the grain of the polishing shall be consistent in direction throughout the length of the backsplash and sink compartment.

7. Finishes:
   a) Paint and coatings shall be of an N.S.F. approved type suitable for use in conjunction with foodservice equipment. Such paint or coating shall be durable, non-toxic, non-dusting, non-flaking and mildew resistant, shall comply with all governing regulations, and shall be applied in accordance with the manufacturers recommendations.

   b) All exterior, galvanized parts, exposed members of framework, and wrought steel pipe where specified to be painted shall be cleaned, primed
with rust inhibiting primer, de-greased, and finished with two (2) coats of glossy enamel grey hammertone paint, unless otherwise noted.

c) Where baked enamel finishes are specified, they shall be oven baked on the fixtures for a minimum of 1-1/2 hours at a minimum temperature of 300º Fahrenheit.

d) Fabricated equipment shall be spray coated with plastic suitable for protecting the equipment during transport and installation. The coating shall be easily removable after the equipment installation is complete at the job site, and final clean-up has begun.

D. Construction:

1. Legs:
   a) All tubular stands for open base tables, sinks, or dish tables shall have legs constructed of 1-5/8" O.D. stainless steel tubing, with 1-1/4" O.D., #16 gauge stainless steel crossbracing running between legs at a point 10" above finished floor.
   b) All joints between legs and crossbracing shall be welded and ground smooth, full 360E.
   c) The top end of legs shall be closely fitted into fully-enclosed stainless steel conical gussets no less than 3" high, similar to Klein #481-58 or #483-58, or approved equal.
   d) Gussets shall be fully welded to framing reinforcing members, so that, set screw is not visible from front.
   e) Legs without crossrails will not be accepted.
   f) Legs shall be spaced at not more than 5'-6" on centers, unless otherwise specified.

2. Feet:
   a) All tubular legs will be swedged for appearance and close fit to United Show Case #BF-158, or approved equal, fully enclosed, stainless steel bullet-shaped foot.
      1) The foot shall be threaded into a collar and completely welded inside the tubular leg to permit a maximum adjustment of 2" without any thread exposure.
      2) Threads shall be National Course Series Class 2 fit or better, machined to prevent end play when foot is at maximum adjustment.
      3) The bullet-shaped foot shall have slightly rounded bottom to protect the floor, and a minimum bearing surface of 3/4" diameter of stainless steel-to-floor contact.
      4) Bottom of tubular leg shall be finished off smoothly to provide a sanitary fitting and prevent the accumulation of grease or other debris.
   b) Cabinet type fixtures shall be mounted on 8" high die-stamped, sanitary, two-piece stainless steel legs no less than 2-3/4" in diameter at the top, Component Hardware #A72-0811, or approved equal.
      1) The bottom fully enclosed, stainless steel, bullet-shaped foot threads up into the inside of the upper member, with a male threaded 5/8" bushing to permit maximum adjustment of 2" without thread exposure.
      2) The upper section shall be stamped in a neat design with a flared inverted shoulder and fully welded to a base plate designed for anchoring to the channel underbracing.
3. Table Tops:
   a) Tables shall be constructed of stainless steel, and of a thickness not less than #14 gauge with 1-3/4" by 120º rolled edges, or as otherwise specified and detailed.
   b) All corners shall be bull-nosed and of the same radius as rolled edges.
   c) Joints where required shall be butt-welded and ground smooth to present a uniform one-piece appearance.
   d) All tops shall be reinforced on the underside with a fully welded framework of 1-1/2"x1-1/2"x1/8" galvanized steel angles with the framing extending around the top perimeter and crossbraced on 24" maximum centers.
   e) 1"x4"x1" galvanized or stainless steel, fully welded, cross channel, closed end members placed at each pair of legs with one (1) channel running lengthwise will also be acceptable.
   f) All tops shall be reinforced so that there will be no noticeable deflection.
   g) Metal tops where adjacent to walls or other items of equipment, shall be constructed with integral, coved, back and/or end splashes as required and specified in accordance with the standard details contained herein. Close all ends of splashes.

4. Enclosed Bases:
   a) All enclosed bases or cabinet bodies shall be of seamless #18 gauge stainless steel construction, enclosed on the ends and sides as required and called for under each item.
   b) Ends of body shall terminate at front or operator's side in a 2" wide mullion, vertical, and completely enclosed. All intermediate mullions shall be completely enclosed.
   c) The bases shall be reinforced at the top with a framework of 1-1/2"x1-1/2"x1/8" galvanized angles, with all corners mitered and welded solid.
   d) Underside of top shall be reinforced with channels and gussets where necessary. Additional angles and cross members shall be provided to reinforce shelves and support tops under heavy tabletop equipment.
   e) Where sinks or other drop-in equipment occur, provide additional reinforcing extending crosswise, both sides of opening.
   f) In the case of fixtures fitting against or between walls, the bodies shall be set in 1" or 2" from the wall line, with the tops continuing to the wall line with integral, coved splashes as specified. Extend vertical face of body to the wall line only. This will permit adjustment to wall irregularities. Vertical trim strips will not be accepted.
   g) Bodies shall be fitted with counter style stainless steel legs as hereinbefore specified.

5. Drawers:
   a) Drawers, where specified, shall have removable pan inserts of #18 gauge stainless steel, and shall be approximately 20"x20"x5" deep unless otherwise specified.
      1) Perimeter top edge shall be flanged out 1/2".
      2) All interior horizontal corners shall be rounded on a 1" radius, and all interior vertical corners shall be rounded on a 2" radius.
   b) Fronts shall be double pan #16 gauge stainless steel construction, 1" thick, insulated with a semi-rigid, fiberglass board, unfaced, having a three-pound density.
1) The top of the drawer face shall be formed as an integral pull by breaking the front pan back on a 45° angle 1", then straight up 1", back to front 1", and then down at the front 3/4".
2) Drawer front shall have all edges and corners ground smooth with a radius edge pull.
3) Provide hard rubber button bumpers attached to rear of drawer face at each corner.
   c) The drawer shall have an all welded frame of 1"x1", #16 gauge stainless steel angles sized to fit the removable pan insert.
   d) Drawers shall operate on #14 gauge full-extension slides with stainless steel roller bearings with hardened and ground raceways, Component Hardware, S52 Series, or approved equal. Slides shall be pitched approximately 3/8" per foot to permit self closing action.
   e) Drawers shall be adequately and neatly fitted to the guides to permit easy operation without rattle or binding.
   f) Slides and frame shall be reinforced to support a dead weight of 150 pounds when drawer is fully extended.
   g) Adjustable stops shall be provided for each drawer at the fully-opened position, and be readily liftable by hand for easy removal of drawer.
   h) All drawers not mounted inside a cabinet body shall be completely enclosed in an #18 gauge stainless steel box-type enclosure and suspended from angle framing under the fixture top. The housing bottom shall be flanged and welded to an #18 gauge stainless steel reinforcing channel extending across the open end.

6. Sliding Doors:
   a) Sliding doors shall be of the double pan type, with the exterior pan constructed of #18 gauge stainless steel with all four sides channeled and corners welded. The interior pan shall be similarly constructed of #20 gauge stainless steel, set into the exterior pan, and welded in place.
   b) All doors shall be insulated with semi-rigid fiberglass board, un-faced, having a three-pound density. Styrofoam shall not be acceptable.
   c) Doors 18" wide or greater, shall have internally welded 4" wide reinforcing channels to prevent warpage.
   d) Each door shall be fitted with a positive flush-type stainless steel pull, Standard-Kiel #1262-1014-1283 recessed handle, or approved equal.
   e) In the back of each door install a 1"x1", #16 gauge stainless steel angle stop welded in a suitable location to prevent the doors from overpassing the flush pulls.
   f) Doors in the closed position shall overlap each other by no more than 2".
   g) Each door shall be fitted with two (2), 1-3/8" ball bearing sheaves fastened to 1"x1/8" stainless steel bar stock welded to the top corners of each door for suspending on an overhead #16 gauge stainless steel channel track. The hangers shall be tapped for 1/4"-20 thumb screw vertical locks which prevent the doors from jumping the track in operation while permitting easy removal for cleaning without tools.
   h) Insure that the bottom of the doors are positively and continuously guided to assure proper alignment and passing regardless of the position of each door.
   i) Provide hard rubber bumpers for doors to close against to insure quiet operation.

7. Hinged Doors:
a) Hinged doors shall be of the same materials and construction as sliding doors previously specified.

b) Hinges shall be heavy duty, stainless steel, removable type, and fastened by tapping into 1/4"x3/4" stainless steel bar stock inside the door pan and behind the door jamb.

c) The door face shall be flush with the cabinet body when fully closed.

d) Size widths of doors equally when installed in pairs, or in series with other pairs, with no door being greater than 36" in width.

e) Doors shall be held closed by permanent magnetic closure devices of an approved type and of sufficient strength to hold the doors shut. Install two (2) per door (minimum), mounted to the door jamb, top and bottom, with opposing chrome-plated steel plates securely fastened to the inner panel of the doors.

8. Undershelves:
   a) All open base tables shall be provided with full-length undershelves of #16 gauge stainless steel fully welded to legs with all joints ground smooth and polished.
   b) Front edge shall turn down 1-1/2" and under 1/2".
   c) Turn up rear and ends 2", with integral coved radius, when specified.
   d) If required by width, provide 1-1/2"x1-1/2"x1/8" galvanized angle bracing mounted to underside, full length.

9. Interior Shelves:
   a) All interior shelves within cabinet bodies, enclosed bases and overhead cabinets, shall be of #16 gauge stainless steel.
   b) Removable shelves shall be constructed in equal sections, and rest in 1-1/2"x1-1/2"x1/8" stainless steel angle frame. Cove all horizontal corners in accordance with N.S.F. requirements.
   c) Stationary shelves shall have 2" turn-up on back and ends, and continuously welded to cabinet body, polished and ground smooth to form a one-piece interior free of any crevices.
   d) Front edge shall turn down 1-1/2" and under 1/2", and finished with "z" bar forming completely enclosed edge for maximum strength and sanitation.
   e) Provide 1-1/2"x1-1/2"x1/8" angle bracing mounted to underside, full length.

10. Elevated Shelves:
    a) Shelves over equipment not adjacent to a wall shall be mounted on 1" diameter #16 gauge stainless steel tubular standards neatly fitted with stainless steel base flanges, unless otherwise specified.
    b) The top of the tubular standards shall be completely welded to #14 gauge stainless steel support channels, full width of overshel.
    c) Inside the tubular standard, and welded to same, provide 1/2" diameter steel tension rod extended through countertop and securely anchored to lower framework reinforcing with nuts and lock washers in such a manner as to assure a stable, sway-free structure.
    d) If required by width, provide 1-1/2"x1-1/2"x1/8" stainless steel angle bracing mounted to underside, full length.
    e) Cantilevered shelves, when called for, shall be #16 gauge stainless steel supported on #14 gauge stainless steel brackets welded to 1-5/8" O.D. stainless steel tubular standards extending through the backsplash, and
fully welded to the table framework. Provide Klein #481-SH welded sleeves where standards penetrate backsplash.

11. Wall Shelves:
   a) Open wall shelves shall be constructed of #16 gauge stainless steel with back and ends turned up 2", positioned 2" out from face of wall, with all corners welded, and supported on #14 gauge stainless steel brackets.
   b) Brackets shall be flanged inward beneath the shelf and at the wall 1-1/2" with intersecting flanges completely welded, and attached to shelf with studs welded to the underside and bolted with stainless steel lock washers and chrome-plated cap nuts.
   c) Each bracket shall be fastened to the wall with a minimum of two (2) 1/4"-20 stainless steel bolts anchored securely by means of toggles or expansion shields.

12. Sinks:
   a) All sinks shall be the size and shape as shown on drawings, and constructed of #14 gauge stainless steel with backs, bottoms and fronts formed of one continuous sheet and the ends welded in place.
   b) Sinks shall have all corners, both vertical and horizontal, coved on a 3/4" radius electrically welded, ground smooth and polished. Solder in filleted corners will not be acceptable.
   c) Multiple compartment sinks shall be divided with double wall, #14 gauge stainless steel partitions with a 1/2" radius on top and all corners rounded as other corners, continuously welded, ground smooth and polished.
   d) The bottom of each compartment shall be creased to a die stamped recess, tapered and shaped to receive a lever type waste without the use of solder, rivets, or welding.
   e) Provide #14 gauge stainless steel waste lever angle bracket mounted to underside of compartment at front.
   f) The front and exposed ends of sinks shall be fabricated with a 1-1/2", 180 degree rolled edge. The back and ends adjacent to walls or other fixtures shall be turned up with integral coved edge 12" high and returned 2-1/2" at the top on a 45º angle. Cap ends of all exposed splashes.
   g) Unless otherwise specified, two (2) faucet holes on 8" centers shall be provided, located over the centerline of partitions between compartments, 2-1/2" down from splash break.
   h) Gussets for legs shall be fully welded all around to #12 gauge stainless steel triangular plates fully welded to underside of sink.
   i) Sinks fabricated into working surfaces shall be constructed of the same material and in like manner to sinks specified above, except rolled edge and backsplash shall be omitted and the bowl shall be completely welded integral and flush with the working surface. Where basket type wastes are called for, they shall be fitted with removable seats.
   j) Where sink bowls are exposed, the exterior shall also be polished to a #4 finish.

13. Sink Drainboards:
   a) Drainboards shall be constructed of the same material as the sinks and shall be welded integral to same.
   b) The front portion of drainboards shall continue the 1-1/2", 180º rolled edge of sink bowls on a continuous and level horizontal plane.
c) The surface of the drainboard shall pitch from 2-1/2" at the end furthest from the sink, to 3" at the bowl; or 1/8" per foot. In addition, the bottom surface shall be dished toward the center for complete drainage.

d) The backsplash of the drainboard shall match the rear of the sink contour and shall be welded integral thereto, running parallel to the floor.

e) Drainboards shall be reinforced on the underside with a framework of 1"x4"x1" stainless steel channel underbracing placed at each pair of legs, with exposed ends capped, and one (1) channel running lengthwise.

f) Where disposer cones are fabricated into drainboards, additional 1"x4"x1" stainless steel channels shall be welded into the top framing, spanning the drainboard from front-to-back on both sides of the cone and located not more than 3" to either side.

g) Disposer control panels or switches shall be supported beneath drainboards, when specified, by means of a #12 gauge stainless steel mounting bracket.

14. Dishtable Tops:

a) Dishtables shall be constructed of #14 gauge stainless steel with all corners, both vertical and horizontal, coved on a 3/4" radius electrically welded, ground smooth and polished. Solder in filleted corners will not be acceptable.

b) Fronts and exposed ends shall be fabricated with a 3" high, 1-1/2", 180E rolled edge with rounded corners. The back and ends adjacent to walls or other fixtures shall be turned up with integral coved edge 12" high and returned 2-1/2" at the top on a 45° angle. Cap ends of all exposed splashes.

c) All tops shall slope 1/8" per foot (minimum).

d) Dishtables shall be reinforced on the underside with a framework of 1"x4"x1" stainless steel channel underbracing placed at each pair of legs, with exposed ends capped, and one (1) channel running lengthwise fully welded between front-to-back channels.

e) Where tops fit into dishmachines, they shall turn down and into, forming a sealed watertight fit, and attached according to dishmachine manufacturers instructions.

f) On each side of dishmachine, tables shall be provided with integral splash shields as part of the backsplash.

g) Silicon filling of gaps caused by poor fit will not be acceptable.

h) On corner-type door machines, provide #14 gauge stainless steel wall-mounted, splash panel to protect adjacent wall, full width of door opening.

15. Cafeteria Style Counters:

a) All counters shall be constructed as previously specified under Enclosed Bases.

b) Provide top and bottom framing for each counter food pan, cold pan, coffee urn, ice cream unit, ice bin, dish dispenser, etc., whether a drop-in unit or a cutout for a portable unit.

c) Where plate shelves occur, frame horizontally 8-1/2" back from counter edge or as design dictates, and at bottom of shelf at counteredge.

d) The countertop shall be constructed of #14 gauge stainless steel, as previously specified, with all joints welded, ground and polished.

e) Fronts and exposed ends shall be stainless steel, plastic laminate or other material as noted in the Item Specifications.

f) All display glass shelving shall be 1/4" polished plate glass and fully trimmed with #18 gauge stainless steel formed channels. Top shelves shall
be the same width as the shelf below. Shelves shall be supported on 5/8" square, #16 gauge stainless steel perimeter tubing fully welded to 1-1/4" square, #16 gauge stainless steel tubing uprights.

g) Provide appropriate adjustable glass sneeze or breath guards trimmed in stainless steel along front, entire length, mounted in Klein 4465-A brackets.

h) Protector shelf over hot food wells shall be #16 gauge stainless steel supported on 1-1/4" square, #16 gauge stainless steel tubing uprights, with 1/4" polished plate glass front and end panels trimmed in #18 gauge stainless steel channels. When specified for self-service, mount bottom edge of front panel 8" above countertop.

i) All display and protector shelves shall be furnished with full-length fluorescent lights wired to on/off switch in counter apron, with lamps and protective shields. Conceal all wiring in tubular uprights.

j) Refer to Item Specification for changes, as required.

k) Counter shall be internally wired complete by the K.E.C., and in such a way as to meet the requirements of the Electrical Code of the job location.

2.04 EQUIPMENT

A. All items listed on the Contract Documents under the heading "Equipment Schedule" shall be furnished in strict accordance with the foregoing specifications and with the following detailed Itemized Specifications.

B. Manufacturer's names and model numbers are shown establishing quality, size, and finish required, representing the Owner's and Consultant's requirements and basis for bid. Equipment is listed hereinafter with same item numbers as shown on Contract Documents.

PART 3 - EXECUTION

3.01 INSPECTION

A. Before beginning the installation of foodservice equipment, the spaces and existing conditions shall be examined by the K.E.C. and any deficiencies, discrepancies, or unsatisfactory conditions for proper installation of foodservice equipment shall be reported to the Architect in writing.

1. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner satisfactory to the installer.

2. Beginning installation shall constitute acceptance of the area.

3.02 PREPARATION

A. Foodservice equipment drawings are diagrammatic and intended to show layout, arrangement, mechanical and electrical requirements.

B. Field verify all measurements at the building prior to fabrication of custom equipment. Coordinate measurements and dimensions with rough-in and space requirements.
3.03 INSTALLATION

A. The K.E.C. shall coordinate his delivery schedule with the Contractor to ensure adequate openings in the building to receive the equipment.

B. Equipment shall be un-crated, fully assembled and set level in position for final connections. Parts shipped loose but required for connection shall be properly tagged and shall be accompanied by the necessary installation instructions.

C. Provide a competent, experienced foreman to supervise installation and final connections with other trades.

D. Remote Refrigeration Systems:
   1. All refrigeration work where applicable to this contract shall be accomplished in an approved manner, using finest quality fittings, controls, valves, etc.
   2. Refrigeration items shall be started up, tested, adjusted, and turned over to the Owner in first class condition and left running in accordance with the manufacturer's instructions.
   3. Refrigeration lines and hook-ups shall be completed by the K.E.C. with the exception of electric, water, and drain line final connections unless otherwise specified.
   4. All copper tubing shall be refrigerant grade A.C.R. or type "L."
   5. Silver solder and/or Sil-Fos shall be used for all refrigerant piping. Soft solder is not acceptable.
   6. All refrigerant lines in pipe sleeves or conduit shall be effectively caulked at ends to prevent entrance of water or vermin and at penetrations through walls or floors.
   7. All tubing shall be securely anchored with clamps, and suspended lines shall be supported with adjustable hangers at 6'-0" o.c. maximum.
   8. Wrap drain line in freezer compartment(s) with approved heat-tape for final connection by Electrical Contractor.

E. Sealing and Caulking:
   1. Prior to the application of sealant, all surfaces shall be thoroughly cleaned and de-greased.
   2. Apply around each unit of permanent installation at all intersections with walls, floors, curbs or other permanent items of equipment.
   3. Joints shall be air-tight, water-tight, vermin-proof, and sanitary for cleaning purposes.
   4. In general, joints shall be not less than 1/8" wide, with backer rod to shape sealant bead properly at 1/4" depth. Shape exposed surfaces of sealant slightly concave, with edges flush with faces of materials at joint.
   5. At internal corner joints, apply sealant or gaskets to form a sanitary cove, of not less than 3/8" radius.
   6. Provide sealant-filled joints up to 3/4" in joint width. Trim strips for wider joints shall be set in a bed of sealant and attached with stainless steel fasteners, 48" o.c., or less, to insure suitable fastening and prevent buckling of the metals fastened.

F. Cutting:
   1. All cutting, fitting, or patching required during installation shall be accomplished by the K.E.C., at his own expense, so as to make the work conform to the plans and specifications.
2. The K.E.C. shall not cut or otherwise alter, except with the consent of the Owner, the work of any other Contractor.
3. Provide cut-outs in foodservice equipment where required to run plumbing, electric, or steam lines through equipment items for final connections.

3.04 FIELD QUALITY CONTROL

A. Inspection:
   1. Provide access to shop fabrication areas during normal working hours to facilitate inspection of the equipment, during construction, by the Architect or his authorized representative.
   2. Errors found during these inspections shall be corrected to the extent required within the scope of the plans, specifications, and approved drawings.

B. Start-Up and Testing:
   1. Delay start-up of foodservice equipment until service lines have been tested, balanced, and adjusted for pressure, voltage, and similar considerations; and until water and steam lines have been cleaned and treated for sanitation.
   2. Before testing, lubricate each equipment item in accordance with manufacturer's recommendations.
   3. Supply a trained person or persons who shall start up all equipment, test and make adjustments as necessary, resulting in each item of equipment, including controls and safety devices, performing in accordance with the manufacturer's specifications.
   4. All gas-fired equipment shall be checked by the local gas company as to calibration, air adjustments, etc., and adjustments made as required.
   5. Repair or replace any equipment found to be defective in its operation, including items which are below capacity or operating with excessive noise or vibration.

C. Demonstration:
   1. Provide an operating demonstration of all equipment at a time of Owner's convenience, to be held in the presence of authorized representatives of the Architect and Owner.
   2. Provide a follow-up kitchen demonstration three (3) months after the initial demonstration or kitchen opening. K.E.C. to coordinate scheduling with manufacturer’s representatives.
   3. Demonstration shall be performed by manufacturer's representative knowledgeable in all aspects of his equipment.
   4. During the demonstration, instruct the Owner's operating personnel in the proper operation and maintenance of the equipment.
   5. Furnish complete, bound, operation/maintenance manuals and certificates of warranty for all items of equipment provided, in accordance with Article 1.5 Submittals, Paragraph F, at this demonstration time.

3.05 ADJUST AND CLEAN

A. Upon completion of installation and tests, clean and sanitize foodservice equipment, and leave in condition ready for use in food service.

B. Remove all protective coverings, and thoroughly clean equipment both internally and externally with stainless steel cleaner.
C. Make and check final adjustments required for proper operation of the equipment.

D. Restore finishes marred during installation to remove abrasions, dents, and other damages. Polish stainless steel surfaces, and touch-up painted surfaces with original paint.

E. Clean up all refuse, rubbish, scrap materials, and debris caused by the work of this Section, and put the site in a neat, orderly, and broom-clean condition.

PART 4 - ITEMIZED EQUIPMENT SPECIFICATIONS

ITEM #1: UTILITY CART, MOBILE

| QUANTITY: | Four (4) |
| MANUFACTURER: | Lakeside Manufacturing Company, Inc. |
| MODEL NO.: | 543 (N058) |
| PERTINENT DATA: | 700-Lb. Capacity, 21" x 33" Shelf Size, Two-Tier, NSF Version |
| UTILITIES REQ'D: | ---- |
| ALTERNATE MFRS | None |

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. All four (4) casters swivel-type.

ITEM #2: DUNNAGE RACK, MOBILE

| QUANTITY: | Two (2) |
| MANUFACTURER: | InterMetro Industries Corporation |
| MODEL NO.: | MetroMax i (N058) |
| PERTINENT DATA: | Open-Grid Shelf Mat, Heavy-Duty, Metroseal 3™ Epoxy-Coated |
| UTILITIES REQ'D: | ---- |
| ALTERNATE MFRS | None |

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

Dry Storage:

1. Two (2) #MHP55K3 units; 24" W x 48" L.
**ITEM #3: CAN RACK, MOBILE**

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<td>MANUFACTURER:</td>
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<td>MODEL NO.:</td>
<td>97294CK (N058)</td>
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<tr>
<td>PERTINENT DATA:</td>
<td>All Welded Aluminum Construction, (156) #10 Can Capacity</td>
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<td>UTILITIES REQ'D:</td>
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<td>ALTERNATE MFRS.:</td>
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Furnish and set-in-place per Equipment Plan, Sheet K-101 and Manufacturer's Instructions.

**ITEM #4: SHELVING, MOBILE**

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<td>MANUFACTURER:</td>
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<tr>
<td>MODEL NO.:</td>
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<tr>
<td>PERTINENT DATA:</td>
<td>Five-Tier High, Stationary, Free-Standing, Chrome-Plated, Wire</td>
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<td>UTILITIES REQ'D:</td>
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<tr>
<td>ALTERNATE MFRS.:</td>
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</tr>
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Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

**Dry Storage:**

1. Relocate four (4) existing 24" x 48" 5-tier high units to position shown on Equipment Plan, Sheet K-101.
2. Three (3) #2436NC sections; 24" W x 36" L x 5-tier high.
3. One (1) #2448NC section; 24" W x 48" L x 5-tier high.
4. Sixteen (16) #74UP chrome-plated posts for stem casters, 73-7/8" high.
5. Eight (8) #5MP polyurethane swivel casters with donut bumpers.
6. Eight (8) #5MPB polyurethane swivel casters with brakes and donut bumpers.
7. Plastic split sleeves, quantity as required.
8. Locate bottom shelf @ 12" A.F.F.; space remaining shelves equally.
ITEM #5:  WALK-IN COOLER/FREEZER

QUANTITY:  One (1)
MANUFACTURER:  Thermo-Kool
MODEL NO.:  Indoor Installation (N058)
PERTINENT DATA:  4" Foamed-In-Place Urethane Panels - Class I, NSF Construction
UTILITIES REQ'D:  1500W, 120V, 1PH; 3/4" IW
ALTERNATE MFRS.:  Bally; Kolpak

Furnish and install per Equipment Plan, Sheet K-101; Building Conditions Plan, Sheet K-103; Manufacturer's Shop Drawing and the following:

1. Two Section Unit; 28'-1" L x 9'-2" D x 8'-6" H. Interior width: Cooler - 6'-6", Freezer - 7'-9".

2. Exterior Finish:
   -- 26 GA stucco embossed galvanized where unexposed.
   -- 22 GA stucco embossed stainless steel where exposed.

3. Interior Finish:
   -- White .040 stucco embossed aluminum walls.
   -- White acrylic enamel baked-on 26 GA smooth galvanized steel ceiling.

4. Interior Floor:
   -- 4" prefabricated floor panels installed in 6" deep floor recess over hot asphalt paper or 6 MIL polyethylene sheets on building floor slab.
   -- 2" setting bed with two (2) layers of wire reinforcing mesh fabric and Alto Stronghold 30 sheet vinyl applied over floor panels with 6" high integral coved base, interior and exterior of box, installed over prefabricated floor panel by Tile Contractor.

5. Entrance Door:
   -- Two (2) flush-mounted, self-closing left-hand hinged doors with 36"x84" net opening.
   -- Polished chrome camlift hinges with lift-off capability. Provide one (1) extra hinge per door, three (3) total.
   -- Kason #1236 polished chrome lever-action handle with knob-turn release and cylinder lock, each door.
   -- Kason #09440004 polished chrome dead-bolt lock, factory mounted.
   -- Kason #109400003 hydraulic door closer.
   -- Standard 2" diameter dial thermometer factory mounted in door frame.
   -- Foot treadle door opener.
   -- Pilot light and switch assembly factory mounted in door frame with stainless steel coverplate.
   -- 36" high aluminum diamond tread kickplates, interior and exterior, of door, frame and jambs.
   -- 14" x 24" heated observation windows, both doors.
   -- Kason #907 interior door handle, factory mounted with concealed metal backing plate.
   -- Round vinyl door bumper mounted to front exterior face to protect handle from puncturing wall when door in full open position.
   -- 12 gauge stainless steel heated threshold at each entrance door.
ITEM #5:  (Continued)

-- Undercut doors for quarry tile floor.
-- Kason #1806 LED light fixture with high-impact plastic globe factory mounted centered above door opening. Conceal conduit within header of door frame and extend to junction box mounted on top of door panel.
-- Engraved phenolic plastic compartment sign - 12" long x 2" high; white in color with 1" high blue CAPITAL letters mounted on door above observation window; (1) – FREEZER, (1) COOLER.

6. Heated pressure relief port in freezer compartment.

7. Six (6) Kason #1810L21248LB 48" long twin-tube LED light fixtures with shatter-proof high impact plastic covers centrally-mounted to walk-in ceiling; four (4) for the freezer, two (2) for the cooler. Fixtures shipped loose and mounted by K.E.C.; final connection by Electrical Contractor. K.E.C. to seal and insulate with silicone sealant all knock-outs in fixture casing to prevent moisture infiltration.

8. One (1) #TK4700 walk-in monitor system with #TK4 light control and panic button factory mounted in each door frame and inter-wired with building monitoring system by Electrical Contractor, as required. Extend temperature probe to rear of compartment mounted at ceiling behind evaporator coil.

9. Provide and install trim strips of matching exterior finish between ends of walk-in panels and building walls from floor to finished ceiling. K.E.C. to verify ceiling height.


11. All electrical conduit shall be run concealed above walk-in ceiling per Detail, Sheet K-107.

12. Evaporator coil drain lines shall be run to floor drain with P-trap on exterior of box by K.E.C.

13. Black flexible "Armaflex" insulation applied to exposed drain lines and fittings within interior of box by K.E.C.

14. Spiral heat tape applied to drain line within interior of freezer compartment prior to application of insulation by K.E.C. Drain line heating cable shall be installed for continuous 24-hour operation.

15. Coordinate location of sprinkler head drops and provide penetrations, where necessary.

16. K.E.C. to seal and insulate all openings to prevent infiltration of warm air into cooler/freezer compartments.

17. Quality Inspection Requirement:
-- Walk-In shall be completely erected at the manufacturer’s facility prior to shipment and a quality control inspection performed on the assembled structure. A digital photograph of factory assembled walk-in shall be provided for the K.E.C. permanent records and included in the operation and maintenance manuals.
ITEM #5: (Continued)

18. Accessories:
   -- One (1) Kolpak #HAL-C2-N1 air shield mounted vertically on the hinge side of doorjamb inside each walk-in compartment. Electrical Contractor to provide power receptacle and final connection.
   -- 6" high 1/8" thick aluminum cove baseboard, to be installed where panels are exposed at kitchen side, fastened with countersink screws and seal with gray-color silicone sealant to finish floor and walk-in panels.

ITEM #6: COOLER REFRIGERATION SYSTEM

| QUANTITY: | One (1) |
| MANUFACTURER: | ColdZone |
| MODEL NO.: | CFO100M4S-E (N058) |
| PERTINENT DATA: | Uni-Pak, Air Cooled, Outdoor Installation, Remote, With EcoNet® Intelligent Control |
| UTILITIES REQ'D: | 4.1A, 208V, 3PH |
| ALTERNATE MFRS.: | RDT; Omni-Temp; Bally Refrigerated Boxes, Inc. |

Furnish and install per Equipment Plan, Sheet K-101; Manufacturer's Shop Drawing and the following:

1. Condensing Unit: Factory Pre-Assembled, Scroll, Medium Temperature, R-448C.

2. System located outdoors on roof. Curb with pitch-pocket furnished and installed by General Contractor. See Mechanical Roof Plan for exact location.

3. Complete winterization package and condensing unit weatherproof cover.

4. Overall size: 28¼" L x 248" W x 19" H.

5. Weight: 195 lbs.

6. Evaporator Coil with High-Efficiency EC Motors: Low-Profile, End-Mount Type, Model CL6A094SDARE; 1.6A, 120V, 1PH
   -- System to operate at +35°F.
   -- Furnished complete with thermostat, solenoid and expansion valves factory mounted ready for final connection by Refrigeration Contractor.
   -- EcoNet® Intelligent Control with remote monitoring and diagnostics.
   -- Furnish Cat5 cable and interwire to building monitoring system by Electrical Contractor.

7. Complete refrigeration system warrantee: five (5) years for the compressor, Two (2) years for the condensing unit, and Two (2) years for all parts of the evaporator coil.

ITEM #7: FREEZER REFRIGERATION SYSTEM

QUANTITY: One (1)
MANUFACTURER: ColdZone
MODEL NO.: CFO100M4S-E (N058)
PERTINENT DATA: Uni-Pak, Air Cooled, Outdoor Installation, Remote, With EcoNet® Intelligent Control
UTILITIES REQ'D: 4.1A, 208V, 3PH
ALTERNATE MFRS.: RDT; Omni-Temp; Bally Refrigerated Boxes, Inc.

Furnish and install per Equipment Plan, Sheet K-101; Manufacturer's Shop Drawing and the following:

1. Condensing Unit: Factory Pre-Assembled, Scroll, Low Temperature, R-448A.

2. System located outdoors on roof. Curb with pitch-pocket furnished and installed by General Contractor. See Mechanical Roof Plan for exact location.

3. Complete winterization package and condensing unit weatherproof cover.

4. Overall size: 33" L x 44" W x 35" H.

5. Weight: 352 lbs.

6. Evaporator Coil with High-Efficiency EC Motors: Low-Profile, End-Mount Type, Model CL6E121DDARE, 1.5A, 208V, 1PH (Fan); 14.3A, 208V, 1PH (Defrost Heater)
   -- System to operate at -10°F.
   -- Furnished complete with thermostat, solenoid and expansion valves factory mounted ready for final connection by Refrigeration Contractor
   -- EcoNet® Intelligent Control with remote monitoring and diagnostics.
   -- Furnish Cat5 cable and interwire to building monitoring system by Electrical Contractor.

7. Complete refrigeration system warrantee: five (5) years for the compressor, Two (2) years for the condensing unit, and Two (2) years for all parts of the evaporator coil.


ITEM #8: DUNNAGE RACK, MOBILE

QUANTITY: Six (6)
MANUFACTURER: InterMetro Industries Corporation
MODEL NO.: MetroMax i (N058)
PERTINENT DATA: Open-Grid Shelf Mat, Heavy-Duty, Metroseal 3™ Epoxy-Coated
UTILITIES REQ'D: ----
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:
ITEM #8: (Continued)

Cooler:

1. Two (2) #MHP35K3 units; 18" W x 48" L.

Freezer:

1. Two (2) #MHP33K3 units; 18" W x 36" L.
2. Two (2) #MHP35K3 units; 18" W x 48" L.

ITEM #9: SHELVING, MOBILE

QUANTITY: Eleven (11)
MANUFACTURER: InterMetro Industries Corporation
MODEL NO.: Super Erecta (N058)
PERTINENT DATA: Open-Grid Shelf Mat, Wire
UTILITIES REQ'D: ----
ALTERNATE MFRS.: Eagle Group

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

Cooler:

1. One (1) #1836NK3 section; 18" W x 36" L x 4-tier high.
2. Three (3) #1848NK3 sections; 18" W x 48" L x 4-tier high.
4. Eight (8) #5MP polyurethane swivel casters with donut bumpers.
5. Eight (8) #5MPB polyurethane swivel casters with brakes and donut bumpers.
6. Plastic split sleeves, quantity as required.
7. Locate bottom shelf @ 12" A.F.F.; space remaining shelves equally.

Freezer:

1. Two (2) #1836NK3 sections; 18" W x 36" L x 4-tier high.
2. Five (5) #1848NK3 section; 18" W x 48" L x 4-tier high.
3. Twenty-eight (28) #63UPK3 Metroseal 3 epoxy coated posts, 62" high.
4. Fourteen (14) #5MP polyurethane swivel casters with donut bumpers.
ITEM #9:  (Continued)

5. Fourteen (14) #5MPB polyurethane swivel casters with brakes and donut bumpers.

6. Plastic split sleeves, quantity as required.

ITEM #10:  HAND SINK

| QUANTITY: | Five (5) |
| MANUFACTURER: | Eagle Foodservice Equipment Company |
| MODEL NO.: | HSA-10-FA-1P (N058) |
| PERTINENT DATA: | Pedestal Mount, Single Foot Valve With Mixing Valve |
| UTILITIES REQ'D: | 1/2" HW, 1/2" CW, 1-1/2" W |
| ALTERNATE MFRS.: | Advance/Tabco |

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Gooseneck faucet, stopper, pedestal, P-trap, tailpiece and pedal valve.

2. All plumbing lines and components chrome-plated or stainless steel.

3. Accessories:
   -- Left and right integral splash shields.

ITEM #11: SOAP & TOWEL DISPENSER -- (N.I.K.E.C.--SPECIFIED BY ARCHITECT)

| QUANTITY: | Five (5) |

ITEM #12:  PREP SINK

| QUANTITY: | One (1) |
| MANUFACTURER: | Custom Fabricated |
| MODEL NO: | #14 GA Stainless Steel |
| PERTINENT DATA: | 10'-0" Long x 2'-6" Wide x 2'-10" High |
| UTILITIES REQ'D: | 1/2" HW, 1/2" CW, (2) 1-1/2" IW |
| ALTERNATE MFRS | None |

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-501; and the following:

1. Front and end edge roll per Detail 1.02B.

2. 13" high back splash per Detail 1.04A with finished back.

3. Framework per Detail 1.05.

4. Legs per Detail 1.07. Flanged feet on each corner leg.
ITEM #12: (Continued)

5. Stainless steel undershelf on both ends per Detail 1.11.

6. Sound-deaden underside of sinks and drainboards with NSF-approved sound dampening material.

7. Accessories:
   -- One (1) T&S #B-0133-ADF-12-B pre-rinse spray faucet with 12" swing-spout add-on faucet, 6" wall bracket and backflow preventer. Provide 2"x4" stainless steel column for pre-rinse unit bracket.
   -- Two (2) T&S #B-3950-01 twist waste valves with overflow assemblies and #010387-45 basket strainers.

8. Item will remain shrink-wrapped until ready for final connection by Plumbing Contractor. Immediately following completion of final connections, K.E.C. shall re-shrink-wrap tubs or provide removable panel to avoid use by construction trades.

ITEM #13: WORKTABLE WITH SINK

QUANTITY: One (1)
MANUFACTURER: Custom Fabricated
MODEL NO.: #14 GA Stainless Steel
PERTINENT DATA: 10'-0" Long x 2'-6" Wide x 3'-0" High
UTILITIES REQ'D: 1/2" HW, 1/2" CW, 1-1/2" IW
ALTERNATE MFRS.: None

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-501, and the following:

1. Perimeter edge roll per Detail 1.02M.

2. Framework per Detail 1.05.

3. Legs per Detail 1.07.

4. Stainless steel undershelf per Detail 1.11.

5. Table-mounted stainless steel overshelf per Detail 1.12A.

6. Two (2) stainless steel drawer assemblies per Detail 1.14, Type I, with locks.

7. Worktable per Detail 2.01.

8. 15" x 18 " x 8" deep utility sink per Detail 3.04 with stainless steel waste lever angle bracket fully welded to underside of sink.

9. Two (2) 20A, 120V duplex receptacles with stainless steel faceplate mounted to underside of table pre-wired to common junction box below undershelf. Conceal wiring within tubular leg.
ITEM #13: (Continued)

10. Sound-deaden underside of tabletop with NSF-approved sound dampening material.

11. Accessories:
   -- One (1) Edlund #S-11 manual can opener mounted on end of table, as shown on plan.
   -- One (1) T&S #B-325 deck-mounted swing-spout gooseneck faucet with #B-199-2 aerator.

ITEM #14: WORKTABLE WITH SINK

| QUANTITY | One (1) |
| MANUFACTURER | Custom Fabricated |
| MODEL NO. | #14 GA Stainless Steel |
| PERTINENT DATA | 10'-0" Long x 2'-6" Wide x 3'-0" High |
| UTILITIES REQ'D | 1/2" HW, 1/2" CW, 1-1/2" IW |
| ALTERNATE MFRS. | None |

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-501, and the following:

1. Perimeter edge roll per Detail 1.02M.

2. Framework per Detail 1.05.

3. Legs per Detail 1.07.

4. Stainless steel undershelf per Detail 1.11.

5. Table-mounted stainless steel overshelf per Detail 1.12A.

6. Three-tier high stainless steel drawer assembly per Detail 1.14, Type I with locks.

7. Worktable per Detail 2.01.

8. 15" x 18" x 8" deep utility sink per Detail 3.04 with stainless steel waste lever angle bracket fully welded to underside of sink.

9. Two (2) 20A, 120V duplex receptacles with stainless steel faceplate mounted to underside of table pre-wired to common junction box below undershelf. Conceal wiring within tubular leg.

10. Sound-deaden underside of tabletop with NSF-approved sound dampening material.

11. Accessories:
    -- One (1) T&S #B-325 deck-mounted swing-spout gooseneck faucet with #B-199-2 aerator.
    -- One (1) Cutting Board Storage channel.
ITEM #14: (Continued)

-- Two (2) Vollrath model 5200370 cutting boards, Green for HACCP Program (Fruits/Vegetables); overall 18" x 24" x 1/2"T. Heat resistant to 185° F; non-absorbent high density Polyethylene; stain resistant; non skid sandblast finish; dishwasher safe; NSF.
-- Knife rack for six (6) to eight (8) knives.

ITEM #15: WORKTABLE

QUANTITY: One (1)
MANUFACTURER: Custom Fabricated
MODEL NO.: #14 GA Stainless Steel
PERTINENT DATA: 10'-0" Long x 2'-6" Wide x 3'-0" High
UTILITIES REQ'D: ----
ALTERNATE MFRS.: None

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-501, and the following:

1. Perimeter edge roll per Detail 1.02M.
2. Framework per Detail 1.05.
3. Legs per Detail 1.07.
4. Stainless steel undershelf per Detail 1.11.
5. Table-mounted stainless steel overshel per Detail 1.12A.
6. Three-tier high stainless steel drawer assembly per Detail 1.14, Type I with locks.
7. Worktable per Detail 2.01.
8. One (1) 20A, 120V duplex receptacle with stainless steel faceplate mounted to underside of table pre-wired to common junction box below undershelf. Conceal wiring within tubular leg.
9. Sound-deaden underside of tabletop with NSF-approved sound dampening material.
10. Accessories:
    -- One (1) Edlund #S-11 manual can opener mounted on end of table, as shown on plan.
    -- One (1) Cutting Board Storage channel.
    -- Two (2) Vollrath model 5200370 cutting boards, Green for HACCP Program (Fruits/Vegetables); overall 18" x 24" x 1/2"T. Heat resistant to 185° F; non-absorbent high density Polyethylene; stain resistant; non skid sandblast finish; dishwasher safe; NSF.
    -- Knife rack for six (6) to eight (8) knives.
**ITEM #16: OVERHEAD STORAGE CABINET**

**QUANTITY:** Two (2)  
**MANUFACTURER:** Custom Fabricated  
**MODEL NO.:** #14 GA Stainless Steel  
**PERTINENT DATA:** 4'-0" Long x 1'-8" Wide x 3'-0" High, With Hinged Doors on Both Sides  
**UTILITIES REQ'D:** ----  
**ALTERNATE MFRS.:** None

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-501, and the following:

1. Adjustable intermediate shelf.

**ITEM #17: WORKTABLE, MOBILE**

**QUANTITY:** Two (2)  
**MANUFACTURER:** Custom Fabricated  
**MODEL NO.:** #14 GA Stainless Steel  
**PERTINENT DATA:** 8'-0" Long x 2'-6" Wide x 3'-0" High  
**UTILITIES REQ'D:** ----  
**ALTERNATE MFRS.:** None

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-501, and the following:

1. Perimeter edge roll per Detail 1.02M.  
2. Framework per Detail 1.05.  
3. Legs per Detail 1.07.  
4. 4" diameter heavy-duty swivel casters, front two (2) with brakes.  
5. Stainless steel undershelf per Detail 1.11.  
6. Two (2) stainless steel drawer assemblies per Detail 1.14, Type I, with locks.  
7. Worktable per Detail 2.01.  
8. Sound-deaden underside of tabletop with NSF-approved sound dampening material.

**ITEM #18: PAN RACK CART, MOBILE - (EXISTING TO BE RE-USED)**

**QUANTITY:** Five (5)  

Relocate to position shown on Equipment Plan, Sheet K-101 and Manufacturer’s Instructions.
ITEM #19:  EQUIPMENT STAND, MOBILE -- (N.I.C. – FUTURE)

QUANTITY: Two (2)
MANUFACTURER: Piper Products, Inc.
MODEL NO.: MX-29-TSS (N058)
PERTINENT DATA: All Stainless Steel, 23" W x 29" D x 28" H, With S/S Undershelf
UTILITIES REQ'D: ----
ALTERNATE MFR.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Accessories:
   -- Heavy-duty swivel casters with polyurethane tires, two (2) with brakes.

ITEM #20:  MIXER, 20-QUART -- (N.I.C. – FUTURE)

QUANTITY: One (1)
MANUFACTURER: Hobart Corporation
MODEL NO.: HL200-1STD (N058)
PERTINENT DATA: Bench Model, Standard Finish with Timer, Legacy Series
UTILITIES REQ'D: 1/2 HP, 120V, 1PH
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

2. Accessories:
   -- One (1) #EDDOUGH-ALU20H “ED” Dough Hook.
   -- One (1) #SPLASH-LEX020 lexan splash cover.

ITEM #21:  SLICER -- (N.I.C. – FUTURE)

QUANTITY: One (1)
MANUFACTURER: Hobart Corporation
MODEL NO.: HS7-1 (N058)
PERTINENT DATA: Automatic 4- Speed Carriage Drive, 13" Diameter Blade
UTILITIES REQ'D: 1/2 HP, 120V, 1PH
ALTERNATE MFRS.: Bizerba; Globe

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:
ITEM #21: (Continued)

1. Accessories:
   -- #HS-FENFUL product fence.
   -- #HS-CHUTE tubular chutes with plunger.
   -- #HS-LEGSET 4½” legs.

2. Cord and plug set.

ITEM #22: EXHAUST CANOPY

QUANTITY: One (1)
MANUFACTURER: Captive-Aire Systems, Inc.
MODEL NO.: 6630-VHB-G-ND (N058)
PERTINENT DATA: Stainless Steel, Non-Grease, Heat/Vapor Removal Only Type
UTILITIES REQ'D: 3,752 CFM Exhaust; 36W, 120V, 1PH (Lights); 3/4” IW
ALTERNATE MFRS.: Gaylord; Avtec

Furnish and install per Equipment Plan, Sheet K-101; Exhaust Canopy Detail Drawing, Sheet K-505; Manufacturer's Shop Drawing and the following:

1. 12'-6" long x 5'-6" wide x 2'-6" high, with bottom edge mounted at 6'-8" A.F.F. Length comprised of four (4) 6'-3" long sections. Entire unit constructed of 18 GA stainless steel type 304 with liquid tight all welded external continuous seams and joints.


3. On/Off fan and light switches factory mounted in Item #57: Utility Raceway.


5. Hanger rods and support system from structure above by other contract. K.E.C. to coordinate method and location with other trades.

6. Integral stainless steel hanger brackets.

7. 12" wide stainless steel angle framing and closure panels @ rear to accommodate Utility Raceway, Item #57.

8. 1" wide full-perimeter integral gutter with 1" turn-up and 3/4" stainless steel drain connection.

9. Accessories:
   -- Balance dampers.
   -- Field wrapper.
ITEM #23: CONVECTION OVEN, MOBILE - (EXISTING TO BE RE-USED)

QUANTITY: One (1)

Relocate to position shown on Equipment Plan, Sheet K-101, Manufacturer’s Instructions and the following:

1. Electrical and mechanical services supplied through Utility Raceway, Item #57.

ITEM #24: HYDROVECTION OVEN - (N.I.C. – *OFCl)

QUANTITY: One (1)

*Owner Furnished Contractor Installed per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

1. Electrical and mechanical services supplied through Utility Raceway, Item #57.

ITEM #25: FLOOR TROUGH

QUANTITY: One (1)

MANUFACTURER: IMC Teddy Foodservice Corporation
MODEL NO.: ASFT1284-SGAS (N058)
PERTINENT DATA: Anti-Spill, 14 GA S/S
UTILITIES REQ'D: 4" W
ALTERNATE MFRS.: Eagle Group

Furnish and install per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. 7'-0" long x 1'-0" wide, constructed and installed per Detail, Sheet K-103.
2. SGAS-12 anti-slip stainless steel subway style removable floor grate in equal sections, the lessor of 30 lbs. and/or 20" long.
3. Bottom of trough pitched to integral stainless steel waste cup with removable perforated stainless steel basket.
4. Top of trough installed flush with top of kitchen finished floor.
5. Unit furnished by K.E.C.; installed by Plumbing Contractor.
ITEM #26: TILTING KETTLE, 40-GALLON

QUANTITY: One (1)
MANUFACTURER: Cleveland Range, Inc.
MODEL NO.: KGL40T (N058)
PERTINENT DATA: Tri-Leg, Self-Contained, 2/3-Jacketed
UTILITIES REQ'D: 10.0A, 120V, 1PH; ½" HW, ½" CW, 2" IW; 3/4” Natural Gas @ 140 MBH

ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Accessories:
   -- One (1) #CHS25 spring-assisted cover.
   -- One (1) #DPKT double-pantry faucet with swing spout and bracket.
   -- One (1) #MS25 measuring strip.
   -- One (1) #KAK complete kettle accessory kit.
   -- One (1) #FS25 food strainer.
   -- #316G1 316 stainless steel liner.
   -- One (1) #TD2 2" tangent draw-off valve with strainer.
   -- One (1) #PCK pan carrier.

2. Electrical and mechanical services supplied through Utility Raceway, Item #57.

ITEM #27: FLOOR TROUGH

QUANTITY: One (1)
MANUFACTURER: IMC Teddy Foodservice Corporation
MODEL NO.: ASFT1830-SGAS (N058)
PERTINENT DATA: Anti-Spill, 14 GA S/S
UTILITIES REQ'D: 4" W

ALTERNATE MFRS.: Eagle Group

Furnish and install per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. 2'-6" long x 1'-6" wide, constructed and installed per Detail, Sheet K-103.

2. SGAS-18 anti-slip stainless steel subway style removable floor grate in equal sections, the lessor of 30 lbs. and/or 20" long.

3. Bottom of trough pitched to integral stainless steel waste cup with removable perforated stainless steel basket.

4. Top of trough installed flush with top of kitchen finished floor.

5. Unit furnished by K.E.C.; installed by Plumbing Contractor.
ITEM #28: COMBI OVEN - (EXISTING TO BE RE-USED)

QUANTITY: One (1)

Relocate to position shown on Equipment Plan, Sheet K-101, Manufacturer’s Instructions and the following:

1. Electrical and mechanical services supplied through Utility Raceway, Item #57.

ITEM #29: PROOFER HEATED CABINET, MOBILE

QUANTITY: One (1)
MANUFACTURER: Winston Industries
MODEL NO.: HA4522 (N058)
PERTINENT DATA: One-Section, Stainless Steel Exterior & Interior, With Electronic Differential Controls
UTILITIES REQ'D: 19.1A, 120V, 1PH
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Accessories:
   -- Full-perimeter wrap-around non-marking vinyl bumpers.
   -- Pass-Thru: Second pair of doors on back of cabinet.
   -- 5” casters with brakes.

2. Cord and plug set.

ITEM #30: BREAKFAST CARTS, MOBILE

QUANTITY: Eight (8)
MANUFACTURER: InterMetro Industries Corporation
MODEL NO.: Super Erecta (N058)
PERTINENT DATA: Four-Tier High, Chrome-Plated, Wire
UTILITIES REQ'D: ----
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:

Dry Storage:

1. Relocate four (4) existing 18" x 48" 4-tier high units to position shown on Equipment Plan, Sheet K-101.

2. Four (4) #1848NC section; 18" W x 48" L x 4-tier high.

3. Sixteen (16) #63UP chrome-plated posts for stem casters, 61-13/16” high.
ITEM #30:  (Continued)

4. Eight (8) #5MP polyurethane swivel casters with donut bumpers.
5. Eight (8) #5MPB polyurethane swivel casters with brakes and donut bumpers.
6. Plastic split sleeves, quantity as required.
7. Locate bottom shelf @ 12" A.F.F.; space remaining shelves equally.

ITEM #31:  PASS-THRU HEATED CABINET, MOBILE - (EXISTING TO BE RE-USED)

<table>
<thead>
<tr>
<th>QUANTITY:</th>
<th>Two (2)</th>
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</thead>
</table>

Relocate to position shown on Equipment Plan, Sheet K-101 and Manufacturer’s Instructions.

ITEM #32:  PASS-THRU REFRIGERATOR, MOBILE - (EXISTING TO BE RE-USED)

<table>
<thead>
<tr>
<th>QUANTITY:</th>
<th>Two (2)</th>
</tr>
</thead>
</table>

Relocate to position shown on Equipment Plan, Sheet K-101 and Manufacturer’s Instructions.

ITEM #33:  ICE MACHINE/BIN

<table>
<thead>
<tr>
<th>QUANTITY:</th>
<th>One (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MANUFACTURER:</td>
<td>Hoshizaki</td>
</tr>
<tr>
<td>MODEL NO.:</td>
<td>KML-350MAJ/B-300SF (N058)</td>
</tr>
<tr>
<td>PERTINENT DATA:</td>
<td>Air-Cooled, 489-LB. Maker, 300-LB. Bin, Half-Dice Cube Size</td>
</tr>
<tr>
<td>UTILITIES REQ'D:</td>
<td>9.05A, 120V, 1PH; 3/8&quot; CW, ½&quot; IW (Maker Drain), ¾&quot; IW (Bin Drain)</td>
</tr>
<tr>
<td>ALTERNATE MFRS.:</td>
<td>None</td>
</tr>
</tbody>
</table>

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Stainless steel exterior finish, ice machine and bin.
2. Accessories:
   -- One (1) Everpure #EV9324-21 InsurIce i2000² Single water filter system with Ever-pure #EV9534-26 Coarse Filter, mounted on manufacturer’s common wall bracket.
   -- 6" high stainless steel legs with adjustable bullet feet.
   -- Custom fabricated stainless steel ice scoop holder mounted to right-hand side of bin per Detail Sheet K-501.
3. Cord and plug with matching receptacle furnished and installed by Electrical Contractor.
4. Backflow preventor installed on incoming water line by Plumbing Contractor.
<table>
<thead>
<tr>
<th>ITEM #</th>
<th>DESCRIPTION</th>
<th>QUANTITY</th>
<th>MANUFACTURER</th>
<th>MODEL NO.</th>
<th>PERTINENT DATA</th>
<th>UTILITIES REQ'D</th>
<th>ALTERNATE MFR.</th>
</tr>
</thead>
<tbody>
<tr>
<td>#34</td>
<td>ICE CREAM CABINET, MOBILE - (EXISTING TO BE RE-USED)</td>
<td>One (1)</td>
<td>SpecLine by Low-Temp Industries</td>
<td>Modular Stainless Steel Interlocking Counter (N058)</td>
<td>Straight Line Configuration, Corian Extended Tops, Laminate Front and Exposed Ends</td>
<td>----</td>
<td>Duke</td>
</tr>
<tr>
<td>#35</td>
<td>OSCILLATING WALL FAN - (EXISTING TO BE RE-USED)</td>
<td>Two (2)</td>
<td>SpecLine by Low-Temp Industries</td>
<td>Modular Stainless Steel Interlocking Counter (N058)</td>
<td>----</td>
<td>Duke</td>
<td></td>
</tr>
<tr>
<td>#36</td>
<td>MILK COOLER, MOBILE - (EXISTING TO BE RE-USED)</td>
<td>Two (2)</td>
<td>SpecLine by Low-Temp Industries</td>
<td>Modular Stainless Steel Interlocking Counter (N058)</td>
<td>----</td>
<td>Duke</td>
<td></td>
</tr>
<tr>
<td>#37</td>
<td>SERVING COUNTER, MOBILE</td>
<td>Two (2)</td>
<td>SpecLine by Low-Temp Industries, Inc.</td>
<td>28-ST-L-MOD (N058)</td>
<td>Open Base, 2'-4&quot; Long x 3'-8&quot; Wide x 2'-8&quot; High</td>
<td>----</td>
<td>Duke</td>
</tr>
<tr>
<td>#37A</td>
<td>SOLID TOP COUNTER, MOBILE</td>
<td>Two (2)</td>
<td>SpecLine by Low-Temp Industries, Inc.</td>
<td>28-ST-L-MOD (N058)</td>
<td>Open Base, 2'-4&quot; Long x 3'-8&quot; Wide x 2'-8&quot; High</td>
<td>----</td>
<td>Duke</td>
</tr>
</tbody>
</table>

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Shop Drawings and the following:

1. (AA) - Line-up interlocks for counter body.
2. 5” locking swivel casters.
3. Open understorage with bottom and intermediate stainless steel shelf.
ITEM #37A:  (Continued)

4. Front panels with decorative accent; design and color as selected by Architect; K.E.C. to verify.

5. Accessories:
   -- Eagle Group #CC-S-2, stainless steel caster cradle, for each caster, to allow for consistent equipment placement.

ITEM #37B:  HOT FOOD COUNTER, MOBILE

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>Two (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MANUFACTURER</td>
<td>ColorPoint by Low-Temp Industries</td>
</tr>
<tr>
<td>MODEL NO.</td>
<td>EF5-CPA-L-MOD (N058)</td>
</tr>
<tr>
<td>PERTINENT DATA</td>
<td>Electrically Heated, Open Base, Five (5) Wells, With Drains, 6'-2&quot; Long x 3'-8&quot; Wide x 2'-8&quot; High</td>
</tr>
<tr>
<td>UTILITIES REQ'D</td>
<td>40.0A, 120/208V, 1PH; 1/2&quot; HW; 1&quot; IW</td>
</tr>
<tr>
<td>ALTERNATE MFR.</td>
<td>Duke</td>
</tr>
</tbody>
</table>

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Shop Drawing and the following:

1. (G) - Sloped front food protector with tempered glass adjustable front and fixed end panels with radiant heat lamp, LED lights and on/off switch.

2. (AA) - Line-up interlocks for counter body.

3. (Z) - Food wells with individual drains and valves piped independently to isolated compartment within counter base on end with stainless steel hinged access door per Detail, Sheet K-105.

4. 5” locking swivel casters.

5. Open understorage with bottom and intermediate stainless shelf.


7. Front panels with decorative accent; design and color as selected by Architect; K.E.C. to verify.

8. Accessories:
   -- One (1) T&S #B-0208 deck-mounted single pantry fill faucet with swivel nozzle mounted on end opposite Solid Top Counter.
   -- Eagle Group #CC-S-2, stainless steel caster cradle, for each caster, to allow for consistent equipment placement.
   -- One (1) Dormont #W50BP2Q24 ½” diameter x 24” long flexible water connector with quick disconnect and restraining device.
ITEM #37C: SOLID TOP COUNTER, MOBILE

**QUANTITY:** Two (2)
**MANUFACTURER:** SpecLine by Low-Temp Industries, Inc.
**MODEL NO.:** 36-ST-L-MOD (N058)
**PERTINENT DATA:** Open Base, 3'-0" Long x 3'-8" Wide x 2'-8" High
**UTILITIES REQ'D:** ----
**ALTERNATE MFR.:** Duke

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Shop Drawings and the following:

1. (AA) - Line-up interlocks for counter body.
2. 5" locking swivel casters.
3. Open understorage with bottom and intermediate stainless steel shelf.
4. Front and end panels with decorative accent; design and color as selected by Architect; K.E.C. to verify.
5. Accessories:
   -- Eagle Group #CC-S-2, stainless steel caster cradle, for each caster, to allow for consistent equipment placement.

---

ITEM #38: SERVING COUNTER, MOBILE

**QUANTITY:** Two (2)
**MANUFACTURER:** ColorPoint by Low-Temp Industries
**MODEL NO.:** Modular Stainless Steel Interlocking Counter (N058)
**PERTINENT DATA:** Straight Line Configuration, Corian Extended Tops, Laminate Front and Exposed Ends
**UTILITIES REQ'D:** ----
**ALTERNATE MFRS.:** Duke

Refer to individual counter components listed under alpha headings for specification.

---

ITEM #38A: COLD FOOD COUNTER, MOBILE

**QUANTITY:** Two (2)
**MANUFACTURER:** SpecLine by Low Temp Industries, Inc.
**MODEL NO.:** 60-CFMA-L-MOD (N058)
**PERTINENT DATA:** Mechanically Cooled, Enclosed Base, 5'-0" Long x 3'-8" Wide x 2'-8" High
**UTILITIES REQ'D:** 8.5A, 120V, 1PH; 1" IW
**ALTERNATE MFRS.:** Duke

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Shop Drawing and the following:

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ITEM #38A:  (Continued)

1. (G) - Sloped front food protector with tempered glass front and end panels. Provide 8” air space from countertop to bottom of front panel for self-service.
2. (P) - Full-length LED light fixture.
3. (AA) - Line up interlocks for countertop and tray slide.
4. Stainless steel adapter bars.
5. 5” locking swivel casters.
7. Front and side panels with decorative accent; design and color as selected by Architect; K.E.C. to verify.
8. Accessories:
   -- Eagle Group #CC-S-2, stainless steel caster cradle, for each caster, to allow for consistent equipment placement.

ITEM #38B:  CASHIER STAND, MOBILE

QUANTITY: Two (2)
MANUFACTURER: SpecLine by Low-Temp Industries
MODEL NO.: 60-CSE-L-MOD (N058)
PERTINENT DATA: 5'-0" Long x 3'-8" Wide x 2'-8" High
UTILITIES REQ'D: 15.0A, 120V, 1PH, 1"IW
ALTERNATE MFR.: Duke

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Shop Drawing and the following:

1. (AA) - Line-up interlocks for counter body.
2. (DD) – One (1) 15-amp 120-volt convenience outlet mounted below top in counter body. Provide die-raised opening in top for power cord access.
3. (HH) - Utility drawer assembly with locking provision.
4. Stainless steel undershelf below utility drawer in lieu of footrest.
5. 5” locking swivel casters.
7. Front and side panels with decorative accent; design and color as selected by Architect; K.E.C. to verify.
ITEM #38B: (Continued)

8. Accessories:
   -- Eagle Group #CC-S-2, stainless steel caster cradle, for each caster, to allow for consistent equipment placement.

ITEM #39: CASH REGISTER -- (N.I.C. - FURNISHED BY OWNER)

QUANTITY: Two (2)

ITEM #40: SILVERWARE & TRAY DISPENSER, MOBILE

QUANTITY: Two (2)
MANUFACTURER: Caddy Foodservice
MODEL NO.: T-414-MOD (N058)
PERTINENT DATA: 195-Tray Capacity, Stainless Steel Construction, With 8 Cutlery Cylinders, 36" High
UTILITIES REQ'D: ----
ALTERNATE MFRS.: None

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Accessories:
   -- Two (2) #ACC-38 circular leg bumpers
   -- Two (2) #ACC-41 diagonal caster brakes.
   -- Sixteen (16) #ACC-49 perforated plastic cylinders.

2. Reduce unit height to 36" A.F.F.

ITEM #41: ROLLING DOOR -- (N.I.K.E.C. – SPECIFIED BY ARCHITECT)

QUANTITY: One (1)

ITEM #42: TRASH CONTAINER, MOBILE

QUANTITY: Four (4)
MANUFACTURER: Rubbermaid Commercial Products, Inc.
MODEL NO.: FG263200GRAY (N058)
PERTINENT DATA: 32-Gallon Capacity
UTILITIES REQ'D: ----
ALTERNATE MFRS.: Continental Plastic

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:
ITEM #42: (Continued)

1. Accessories:
   -- Four (4) #FG263100GRAY matching flat lids.
   -- Four (4) #FG264000BLA conversion dollies.

ITEM #43: POT WASHING SINK/SOILED DISHTABLE

<table>
<thead>
<tr>
<th>QUANTITY:</th>
<th>One (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MANUFACTURER:</td>
<td>Custom Fabricated</td>
</tr>
<tr>
<td>MODEL NO.:</td>
<td>#14 GA Stainless Steel</td>
</tr>
<tr>
<td>PERTINENT DATA:</td>
<td>13'-5&quot; x 10'-0&quot; Long x 2'-6&quot; Wide x 2'-10&quot; High</td>
</tr>
<tr>
<td>UTILITIES REQ'D:</td>
<td>(2) 3/4&quot; HW, (2) 3/4&quot; CW, (3) 2&quot; IW</td>
</tr>
<tr>
<td>ALTERNATE MFR.:</td>
<td>None</td>
</tr>
</tbody>
</table>

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-501; and the following:

Pot Washing Sink:

1. Front and right end edge rolls per Detail 1.02B.
2. 13" high back splash per Detail 1.04A.
3. Framework per Detail 1.05.
4. Legs per Detail 1.07.
5. Crossbracing per Detail 1.10.
6. Stainless steel undershelf on right end per Detail 1.11.
7. Pot sink and drainboards per Detail 3.01.
8. Sound-deaden underside of sinks and drainboards with NSF-approved sound dampening material.
9. Accessories:
   -- Two (2) T&S #B-290 backsplash mounted swing spout faucets.
   -- Three (3) T&S #B-3950-01 twist waste valves with overflow assemblies and #010387-45 basket strainers.
10. Item will remain shrink-wrapped until ready for final connection by Plumbing Contractor. Immediately following completion of final connections, K.E.C. shall re-shrink-wrap tubs or provide removable panel to avoid use by construction trades.

Soiled Dishtable:

1. Front edge roll per Detail 1.02B.
ITEM #43: (Continued)

2. 13" high backsplash per Detail 1.04A.
3. Framework per Detail 1.05.
4. Legs per Detail 1.07.
5. Crossbracing per Detail 1.10.
6. Soiled dishtable per Detail 2.02.
7. Provide stainless steel crossrails under dishtable for storage of 20" x 20" dish/glass racks.
8. Stainless steel disposer switch bracket.
9. Table trough at entrance to Dishmachine per Detail 2.03.
10. 20” wide x 8” deep integral pre-rinse sink with one-piece removable stainless steel rack slide formed of 2” x 1” channels joined by 1” x 1” cross channels mounted flush with tabletop on 2” x 1” x 3/8” thick welded tab supports. Raise deck at rear of sink 6” for deck-mounted pre-rinse spray and extend to opening of Dishmachine to act as rack guide.
11. Weld collar adapter to underside of sink for Disposer, Item #45.
12. Sound-deaden underside of sink and drainboard with NSF-approved sound dampening material.
13. Accessories:
   -- One (1) T&S #B-0133 splash-mounted pre-rinse spray with built-in backflow preventer and #B-0109 wall bracket.

ITEM #44: RETRACTABLE HOSE REEL

| QUANTITY: | One (1) |
| MANUFACTURER: | Fisher Manufacturing Company |
| MODEL NO.: | 2980 (N058) |
| PERTINENT DATA: | Wall-Mounted, Open No Cover, 35-Feet Hose Capacity |
| UTILITIES REQ'D: | 1/2"HW, 1/2"CW |
| ALTERNATE MFRS.: | T&S Brass |

Furnish and install per Equipment Plan, Sheet K101; Manufacturer's Instructions and the following:

1. Mount hose reel assembly on wall with bottom of spray head @ 6'-0" A.F.F. when in fully retracted position.
2. Accessories:
   -- One (1) Aquatrol Model #1801 recessed stainless steel control cabinet with valves, gauges, fittings and components for a complete system.
ITEM #45: DISPOSER

| QUANTITY:       | One (1)             |
| MANUFACTURER:   | In-Sink-Erator      |
| MODEL NO.:      | SS-200-7-AS101 (N058) |
| PERTINENT DATA: | #7 Collar Adapter Assembly |
| UTILITIES REQ'D:| 2 HP, 480V, 3PH; 1/2" CW, 2" W |
| ALTERNATE MFRS.:| Salvajor             |

Furnish and install per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Aqua saver control center mounted on 14 GA stainless steel bracket.
2. Weld No.7 disposer collar adapter to underside of pre-rinse sink, Item #43.
3. Accessories:
   -- One (1) T&S #B-455 vacuum breaker in lieu of standard unit.

ITEM #46: DISHMACHINE

| QUANTITY:       | One (1)             |
| MANUFACTURER:   | Hobart Corporation  |
| MODEL NO.:      | CL44EN-BAS+BUILDUP (N058) |
| PERTINENT DATA: | Fully Automatic Rack-Type, Power Wash, 180° F Final Rinse, Built-In Booster Heater, 218 Racks/Hour |
| UTILITIES REQ'D:| 27.9A, 480V, 3PH; 10.0A, 120V, 1PH (Drain Cooling Kit); 30KW, 480V, 3PH (Booster Heater); 3/4" HW (180°F.), 1/2" CW (Drain Cooling Kit), 2" IW |
| ALTERNATE MFRS.:| Meiko; Champion      |

Furnish and set-in-place per Equipment Plan, Sheet K-101; Manufacturer's Instructions and the following:

1. Soap dispensing system and rinse additive system by soap chemical vendor.
2. Stainless steel feet, frame, legs and front panel.
3. Common drain manifold and tank fill.
4. Automatic fill with safety switch at drain valve handle.
7. Right-to-left operation.
8. Vent fan control.
ITEM #46: (Continued)

9. Accessories:
   -- Two (2) #EXTHD/E-ADJ extended vent hoods with locking damper,
   -- Two (2) #SHTPAN-RACK open-end 20"x20" racks for 18"x26" sheet pans.
   -- Six (6) #DISHRAK-PEG-20 peg-type, and four (4) #DISHRAK-COM-20 combination-type 20"x20" plastic racks
   -- Two (2) #CURTAIN-KITHTS stainless steel splash shields.
   -- One (1) #DTV-CLEN Drain water tempering kit.
   -- One (1) #CL44EN-BASERH30K 30KW Built-in booster heater.
   -- One (1) #CLE/TBL-SWITCH table limit switch.
   -- One (1) #1/2INSHK-ABSRBR water shock absorber kit.
   -- One (1) #CL44EN-BASHGHTHTS stainless steel frame with 6" extended height chamber.

ITEM #47: VENT DUCT

| QUANTITY: | Two (2) |
| MANUFACTURER: | Custom Fabricated |
| MODEL NO.: | Stainless Steel |
| PERTINENT DATA: | ---- |
| UTILITIES REQ'D: | 300 CFM (Load End), 600 CFM (Unload End) |
| ALTERNATE MFRS.: | None |

Fabricate and install per Equipment Plan, Sheet K-101; and the following:

1. Constructed and installed per Detail 5.06.

ITEM #48: CLEAN DISHTABLE

| QUANTITY: | One (1) |
| MANUFACTURER: | Custom Fabricated |
| MODEL NO.: | #14 GA Stainless Steel |
| PERTINENT DATA: | 5'-6"± Long x 2'-6" Wide x 2'-10" High |
| UTILITIES REQ'D: | ---- |
| ALTERNATE MFRS.: | None |

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-502, and the following:

1. Front edge roll per Detail 1.02B.

2. 13" high back and left end splash per Detail 1.04A. Attach backsplash to wall with fabricator-supplied z-clips.

3. Framework per Detail 1.05.

4. Legs per Detail 1.07.

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**ITEM #48: (Continued)**

5. Stainless steel undershelf per Detail 1.11.
6. Dishtable per Detail 2.02.
7. Sound-deaden underside of drainboard with NSF-approved sound dampening material.
8. Install table-limit switch (supplied with Dishmachine, Item #46) in end of dishtable; inter-wired by Electrical Contractor.

**ITEM #49: POT & PAN SHELVING, MOBILE**

| QUANTITY: | Three (3) |
| MANUFACTURER: | InterMetro Industries Corporation |
| MODEL NO.: | Super Erecta (N058) |
| PERTINENT DATA: | Four-Tier High, 24” Wide, Stainless Steel, Louver Embossed |
| UTILITIES REQ'D: | ---- |
| ALTERNATE MFRS.: | None |

Furnish and set-in-place per Equipment Plan, Sheet K-1; Manufacturer's Instructions and the following:

1. Relocate two (2) existing 24” x 60” 4-tier high units to position shown on Equipment Plan, Sheet K-101.
2. One (1) #2460LS section, 24” W x 60” L x 4-tier high.
3. Four (4) #63UPS stainless posts for stem casters, 63” high.
4. Two (2) #5MP polyurethane swivel casters with donut bumpers.
5. Two (2) #5MPB polyurethane swivel casters with brakes and donut bumpers.
6. Plastic split sleeves, quantity as required.
7. Locate bottom shelf @ 12” A.F.F.; space remaining shelves equally.

**ITEM #50: WASHER/DRYER, STACKED--(N.I.K.E.C. – SPECIFIED BY ARCHITECT)**

| QUANTITY: | One (1) |

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### ITEM #51: FOLDING TABLE, MOBILE

| QUANTITY: | One (1) |
| MANUFACTURER: | Custom Fabricated |
| MODEL NO.: | #14 GA Stainless Steel |
| PERTINENT DATA: | 5'-0" Long x 1'-6" Wide x 3'-0" High |
| UTILITIES REQ'D: | ---- |
| ALTERNATE MFRS.: | None |

Fabricate and set-in-place per Equipment Plan, Sheet K-101; Fabrication Detail, Sheet K-501, and the following:

1. Perimeter edge roll per Detail 1.02M.
2. Framework per Detail 1.05.
3. Legs per Detail 1.07.
4. 4" diameter heavy-duty swivel casters, front two (2) with brakes.
5. Stainless steel undershelf per Detail 1.11.
6. Worktable per Detail 2.01.
7. Sound-deaden underside of tabletop with NSF-approved sound dampening material.

### ITEM #52: SPARE NUMBER

### ITEM #53: MOP SINK & RACK—(N.I.K.E.C.—SPECIFIED BY PLUMBING DIVISION)

| QUANTITY: | One (1) |

### ITEM #54: PRESSURE WASHER

| QUANTITY: | One (1) |
| MANUFACTURER: | Spray Master Technologies |
| MODEL NO.: | SMT-600-WCY (N058) |
| PERTINENT DATA: | #300-5356 Wall-Mounted Pump, 2.2 GPM, Remote Station Controlled, Foodservice Package |
| UTILITIES REQ'D: | 2HP, 120V, 1PH; 3/4"HW |
| ALTERNATE MFR: | None |

Furnish and set-in-place per Equipment Plan, Sheet K-101, Manufacturer's Instructions and the following:
ITEM #54: (Continued)

1. #600-W unit complete with: 3 cylinder CAT® plunger pump, 24V master control panel, thermal limit switch, automatic line-pressure relief, manifold with stainless steel bleeder valve, 6’ water inlet supply hose, powder coated stainless steel wall mount brackets and dual chemical injection.

2. Food service package includes:
   -- One (1) #300-5366 Hummer Jet Jr. cleaning attachment with casters for 1,100 PSI.
   -- One (1) #300-2957 wall & tile brush, 36" & Q.C. shut-off socket.
   -- One (1) #300-8322 trap shooter drain cleaner with 10' hose & Q.C. shut-off socket.

3. Accessories:
   -- One (1) #300-5217 recessed remote station for new masonry with top tube entry.
   -- One (1) #300-5258 heavy-duty portable hose reel with #300-3190, 75-foot hi-pressure hose.
   -- One (1) #300-5240 wall-mounted hose reel with #300-0177 75-foot hi-pressure hose.
   -- Two (2) installation supplies.

4. Backflow prevention device furnished and installed by Plumbing Contractor.

ITEM #55: MOP SINK & RACK--(N.I.K.E.C.--SPECIFIED BY PLUMBING DIVISION)

QUANTITY: One (1)

ITEM #56: SPARE NUMBER

ITEM #57: UTILITY RACEWAY

QUANTITY: One (1)
MANUFACTURER: Captive-Aire Systems, Inc.
MODEL NO.: UDI (N058)
PERTINENT DATA: Island Configuration
UTILITIES REQ'D: 50.0A, 120/208V, 3PH; 3/4"HW, 1" CW; 1-1/2" Natural Gas @ 960 MBH
ALTERNATE MFRS.: Avtec; Gaylord

Furnish and install per Equipment Plan, Sheet K-101; Utility Raceway Details, Sheet K-503; Manufacturer's Shop Drawing and the following:

1. All components and labor necessary for a complete system manufactured in accordance with NEC latest edition, NEMA, NFPA No. 96 and No. 54, Uniform Plumbing Code, ASME, OSHA using only U.L. Listed certified components.

2. 12'-6" long x 12" wide x 6'-8" high with risers, completely pre-wired and pre-plumbed to one final connection point for electric, gas, hot water and cold water. All connections shall face down on horizontal member.
ITEM #57: (Continued)

3. System shall extend up to bottom edge of Exhaust Canopy, Item #22.

4. 5'-2" overall height less risers with peaked top.

5. Risers on each end with 2" penetration into ventilator at 6'-8" A.F.F.

6. Entire raceway shall be constructed of #16 gauge Type 304 stainless steel with a #4 mill finish.

7. Removable link plates constructed of #16 gauge stainless steel.

8. Electrical compartment shall be completely enclosed with stainless steel housing accessible by the removal of link plates. Internal electrical feeder shall be cable busbar having balanced load and phases and with connection lugs for main service. Branch circuit wiring for each electrical connection shall be phase identified and sized in accordance with circuit breaker rated capacity. Raceway shall provide electrical, gas and water service for items #23, #24, #26, #28 and #58.

9. Provide 12" long interchangeable 16 gauge stainless steel link connection plate for each electrical connection wired to electrical load center in riser end with individual circuit breaker(s) and grounding type receptacle with twist-lock feature or pre-wired flexible sealite conduit.

10. On each connection plate provide U.L. listed GFIC ground fault interrupter circuits and matching power supply cords on each 120-volt single-phase connection.

11. Hot water and cold water plumbing compartment shall be isolated from electrical compartment. All piping and disconnects in system shall be color coded.

12. All hot and cold water piping, including individual branch pipe connection, shall be hard temper type "L" copper tubing with copper sweat type solder fittings. At each individual connection, provide A.G.A approved flexible hose(s) with two wall brass and stainless steel construction with quick-disconnect fittings.

13. At each individual gas branch connection, provide 1/4-turn ball valve and 48" long Dormont PVC coated AGA and NSF approved flexible hose with SnapFast quick-disconnect device and double SwivelMAX gas connectors.

14. Provide each mobile piece of equipment with an A.G.A. recognized restraining device protecting respective gas disconnect assemblies and connectors.

15. Provide fire/fuel shut-off for electric equipment per NFPA No. 96. System shall require one final connection by Contractor from fire protection system.

16. Electronic gas solenoid valve factory installed at each in-coming gas service ready for final connection per local codes by Plumbing Contractor; inter-wired by Electrical Contractor.

17. Provide matching cord sets for all electric equipment, eight (8) total.
ITEM #57: (Continued)

18. Neoprene bumper strips, full length.

19. U.L. listed, solid-state control panel mounted in right-hand riser end, with the following integral accessories:
   -- Ventilator start/stop station with adjustable time-delay to exhaust residual heat.
   -- Ventilator light switch, pre-wired in 10ft. flexible conduit ready for connection to light junction box in ventilator by Electrical Contractor.

20. Accessories:
   -- Two (2) Everpure #EV9797-22 Kleen-Steam II single water filter systems factory-installed and housed within left-hand riser. Provide two (2) independent pre-piped water lines to service points for Item #24: Hydrovection Oven, #28: Combi Oven and Item #58: Convection Steamer. Fabricate 18"x18" lexan viewport in riser panel to monitor pressure gauge and filter bowl.
   -- Watts #LF7R dual check valve for each water drop.

21. Fabricated in three (3) sections, assembled in field to present integral one-piece appearance.

22. Main electrical shunt-type circuit breakers mounted in left-hand riser for 50A, 120/208V, 3PH service.

23. Factory System Design Verification (SDV) shall be performed after all inspections are complete. SDV report shall be available once completed.

24. Raceway shall be of same manufacturer as Exhaust Canopy, Item #23.

ITEM #58: CONVECTION STEAMER - (EXISTING TO BE RE-USED)

QUANTITY: One (1)

Relocate to position shown on Equipment Plan, Sheet K-101, Manufacturer’s Instructions and the following:

1. Electrical and mechanical services supplied through Utility Raceway, Item #57.

ITEM #59: RETRACTABLE CORD REEL

QUANTITY: One (1)
MANUFACTURER: APC Group Inc.
MODEL NO.: Kitchen Leash #KL-152012-D (N058)
PERTINENT DATA: Ceiling-Mounted, With Adjustable Stop, Non-GFI Receptacle
UTILITIES REQ'D: 20.0A, 120V, 1PH
ALTERNATE MFRS.: None

Furnish and install per Equipment Plan, Sheet K101; Manufacturer's Instructions and the following:
ITEM #59:  (Continued)

1. Electrical Contractor to furnish and install GFCI type breaker at kitchen electrical panel board.

END OF FOODSERVICE ITEMIZED SPECIFICATIONS
STANDARD
DETAILS
NOTE! JOINED SECTIONS SHALL BE DRAWN TOGETHER LEAVING ONLY A HAIRLINE SEAM.

A. BOLT DRAWN JOINT

NOTE! ON FIXTURES SPECIFIED WITH WELDED FIELD JOINTS, WELDS SHALL BE CONTINUOUS, GROUND & POLISHED LEAVING NO VISIBLE EVIDENCE OF WELD.

B. WELDED BUTT JOINT

NOTE! JOINED SECTIONS SHALL BE DRAWN TOGETHER LEAVING ONLY A HAIRLINE SEAM.

C. RAISED CAP SEAM-KNUCKLE JOINT

ACPS: JOHN ADAMS ES KITCHEN RENOVATION
Alexandria, Virginia
PE Project 72641.00.0

FOODSERVICE EQUIPMENT
11 40 00 - 63
November 4, 2019
ROLLED A.

RAISED ROLLED B.

INVERTED "V" EDGE C.

BULL NOSE ROLLED D.

MARINE EDGE E.

FLOUR GUTTER F.

RECIPE CARD HOLDER G.

UNDERSHELF EDGE H.

BULL NOSE CORNER I.

NYIKOS ASSOCIATES, INC.
Food Facilities Design/Consulting

DESCRIPTION
EDGES
STANDARD DTL:
1.02

ACPS: JOHN ADAMS ES KITCHEN RENOVATION
Alexandria, Virginia
PE Project 72641.00.0

FOODSERVICE EQUIPMENT
11 40 00 - 64
November 4, 2019
<table>
<thead>
<tr>
<th>RAISED OPENING EDGE J.</th>
<th>RAISED OPENING EDGE K.</th>
<th>STRAIGHT TURN DOWN L.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Diagram of RAISED OPENING EDGE J." /></td>
<td><img src="image2" alt="Diagram of RAISED OPENING EDGE K." /></td>
<td><img src="image3" alt="Diagram of STRAIGHT TURN DOWN L." /></td>
</tr>
<tr>
<td>TURNED DOWN EDGE M.</td>
<td></td>
<td></td>
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<tr>
<td><img src="image4" alt="Diagram of TURNED DOWN EDGE M." /></td>
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**NYIKOS ASSOCIATES, INC.**
Food Facilities Design/Consulting

**DESCRIPTION:**

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<th>EDGES</th>
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**STANDARD DTL:**

1.02.1

ACPS: JOHN ADAMS ES KITCHEN RENOVATION  
Alexandria, Virginia  
PE Project 72641.00.0  

FOODSERVICE EQUIPMENT  
11 40 00 - 65  
November 4, 2019
**WALL UNIT**

**DETAIL A**

a. 2-1/2" AT SINK TO ALLOW FOR CONNECTED OVERFLOW.

b. 1/2 GA. S/S CLIPS, 4" LONG, FASTENED TO EACH WALL END OF EACH UNIT & 4'-0" ON CENTER. SECURE TO WALL W/A MINIMUM OF TWO 1/4"x20 S/S TOGGLE BOLTS OR EXPANSION SHIELDS.

c. EXPOSED ENDS TO BE FULLY WELDED CLOSED.

d. SEAL ALL AROUND TO WALL WITH SILICONE SEALANT.

---

**FREE STANDING UNIT**

**DETAIL B**

c. 1/8"x1/4 GA. S/S x1-1/2" LONG RETAINING CLIP WELDED IN PLACE, ONE AT EACH END OF UNIT AND 12" ON CENTER.

b. 2-1/2"x1-1/2 x1-1/2 1/4 GA S/S CLIP WELDED TO SPLASH, ONE AT EACH END OF UNIT & 12" ON CENTER.

c. 1/4 GA S/S PANEL SECURED TO CLIPS W/ S/S OVALHEAD BOLT, WELD NUT TO CLIP.

d. EXPOSED ENDS TO BE FULLY WELDED.
a. FULLY WELDED CONSTRUCTION.

b. ANGLE LOCATION - ENDS; SIDES OF TOP INSETS; INTERMEDIATES 24" ON CENTER.

c. CHANNEL LOCATION - ENDS AND INTERMEDIATE MAXIMUM 6'-6" O.C.

d. ADD CENTER CHANNEL WHEN DRAINBOARD LENGTH EXCEEDS 5'-6".

e. SECURE TOP TO FRAMEWORK WITH WELDED STUDS, S/S LOCKWASHERS AND CAP NUTS.

f. CLOSE CHANNEL AT FRONT ONLY.
a. FULLY WELD GUSSET TO FRAMEWORK OR SINK
b. 3/4" MINIMUM CLEARANCE ALL AROUND
c. SET SCREW NOT VISIBLE TO WORKING SIDE OF EQUIPMENT.
d. MAXIMUM 1/32" CLEARANCE BETWEEN LEG AND FOOT
e. FOOT SET AT MIDPOINT TO ALLOW 1" ADJUSTMENT UP AND 1" DOWN. WITHOUT THREAD EXPOSURE.
f. LEGS UNSUPPORTED LATERALLY BY CROSSBACKING OR UNDERSHELVES SHALL BE PINNED TO FLOOR USING 1/4" DIA. X 1/2" PINS WELDED TO FOOT AND SET IN MATCHING HOLES IN THE FLOOR.
a. FULLY WELD, GRIND SMOOTH AND POLISH.

NYIKOS ASSOCIATES, INC.
Food Facilities Design/Consulting

DESCRIPTION: CROSSBRACING

STANDARD DTL: 1.10
a. FULLY WELD, GRIND SMOOTH AND POLISH.

b. WHEN SPECIFIED, TURN REAR AND ENDS UP 2'.

NYIKOS ASSOCIATES, INC.
Food Facilities Design/Consulting

UNDERSHELF

DESCRIPTION: UNDERSHELF

STANDARD DTL: 1.11

ACPS: JOHN ADAMS ES KITCHEN RENOVATION
Alexandria, Virginia
PE Project 72641.00.0

FOODSERVICE EQUIPMENT
11 40 00 - 70
November 4, 2019
a. 1/8 GA S/S SHELF
b. STD.- 1/22 EDGE
c. 1/2 x 3/4 x 1' 3/8 GA. S/S CROSS CHANNEL
d. 1/2 x 3/4 x 1' 3/8 GA. S/S LENGTHWISE CHANNEL WHEN LENGTH BETWEEN SUPPORTS EXCEEDS 42'
e. 1/2 GA. S/S BRACKETS FULLY WELDED TO SUPPORT AND CHANNEL.
f. 1-1/4" O.D. 16 GA. S/S UPRIGHT. MAXIMUM 5'-0" ON CENTER.
g. TIGHT FIT. SEAL WITH SILICONE SEALANT.
h. 1-1/2" x 1-1/2" 12 GA. S/S CLIPS WELDED TO REAR OF SPLASH AT DRAINBOARD HEIGHT.
i. 3/8" x 16 S.S. HEX HEAD BOLT, S/S NUT & S/S LOCK WASHER. NUT WELDED IN TUBE.
j. WIDTH AS SPECIFIED.
ACPS: JOHN ADAMS ES KITCHEN RENOVATION
Food Facilities Design/Consulting

FOODSERVICE EQUIPMENT
11 40 00 - 72
November 4, 2019
Worktable

- Edge: STD. - 1.02 AS SPECIFIED.
- Framework: STD. - 1.07
- Leg: STD. - 1.07
- Crossbracing: STD. - 1.10 WHEN SPECIFIED
- Undershelf: STD. - 1.11 WHEN SPECIFIED

When specified, apply sound dampening in compliance with N.S.F. Std. 2, Para. 4.44.
BACKSPLASH
STD. - 1.04

TO SUIT WAREHOUSE
DOOR (SEE STD. - 2.03)

DECREASES
FROM 3'

WHEN SPECIFIED, APPLY SOUND
DAMPENING MASTIC IN
COMPLIANCE WITH N.S.F.
STD. 2, PARA. 4.44.

TOP
14 GA. S/S SECURED
TO FRAME WITH WELDED
STUDS, S/S LOCK-
WASHERS AND CAP NUTS.

EDGE
STD. - 1.02B

3' HIGH ROLLED EDGE AT
WAREHOUSE. PITCH
WORKING SURFACE 1/8'
PER FOOT TO WAREHOUSE.

FRAMEWORK
STD. - 1.05B

LEGS
STD. - 1.07

CROSSBRACING
STD. - 1.10 WHEN
SPECIFIED.

UNDERSHELF
STD. - 1.11 WHEN
SPECIFIED.

NYIKOS
ASSOCIATES, INC.
Food Facilities Design/Consulting

DESCRIPTION: DISHTABLE

STANDARD CTL.: 2.02

ACPS: JOHN ADAMS ES KITCHEN RENOVATION
Alexandria, Virginia
PE Project 72641.00.0

FOODSERVICE EQUIPMENT
11 40 00 - 74
November 4, 2019
a. BASKET - 16 GA. PERFORATED S/S, ALL WELDED CONSTRUCTION.

b. WASTE - 1-1/2\" CHROME PLATED BRASS DRAIN -- STANDARD-KEIL #1816-1812-1368
ACPS: JOHN ADAMS ES KITCHEN RENOVATION FOODSERVICE EQUIPMENT
Alexandria, Virginia 11 40 00 - 76
PE Project 72641.00.0

NYIKOS ASSOCIATES, INC.
Food Facilities Design/Consulting

SINKS AND DRAINBOARDS

CONTINUED ON STD.- 3.01.1

STANDARD DETL: 3.01
e. Drainboards up to 24’ in length require no legs or braces. Drainboards 25’ to 30’ require 1’ O.D. 16 Ga. S/S brace. Drainboards over 30’ require legs and channel framework.

f. Drainboards shall pitch to sink 1/8” per foot of length to provide complete draining without pooling. The 3’ high raised rolled rim at the sink shall decrease in height toward the outer ends of the drainboard.

g. Partitions between compartments to be double walled construction with rounded top, all welded integral with sink body.

h. Back, bottom, and front shall be one continuous piece with ends welded integral, without overlapping joints or open spaces, between compartments.

i. Wastes shall be seated in die stamped depressions without use of solder, rivets or welding. Installed components shall be flush with surrounding surface.

j. Each sink compartment to be pitched and creased to waste to assure complete draining without pooling.

k. Entire unit shall be all welded Cove cornered construction with vertical and horizontal and interior corners having a 3/4” radius.

l. STD.- 1.02 b edge.

m. STD. - 1.04b. backsplash.

n. Underside of drainboards and sinks to be sprayed with sound dampening in compliance with N.S.F. Std. 2 Para 4.4.4 when specified.

o. Faucets - T&S Model B-232 with aerator B-199, removable monel seats and 1/2” I.P.S. male inlets.

p. Wastes - 2” nickel plated bronze rotary handle waste S/S strainer plate with chrome with chrome plated brass connected overflow, standard- Kiel hardware MFG. Co. #1770-1015-1000.

q. Rear cross bracing only.

r. Omit front and rear lengthwise crossbracing under sinks.

s. 12 gauge stainless steel 6” x 6” triangular support plate welded to underside of sinks.

t. Width as specified.
TYPICAL SECTION

a. MATERIAL - 14 GA. S/S

b. ENitre unit shall be all welded cove cornered construction with vertical and horizontal and interior corners having a 3/4" radius.

c. Two sides and bottom shell be one continuous piece with ends welded integral without overlapping joints.

d. Partitions between compartments to be double walled construction with rounded top, all welded integral with sink.

e. Fully weld sink to top without overlapping joints.

f. Wastes shall be seated in die stamped depressions without use of solder rivets or welding. Installed components shall be flush with surrounding surface.

g. FAUCET - T&S model B-222 faucet with B-199 aerator, removable monel seats and 1/2" IPS male inlets.

h. Wastes - 1-1/2" nickel plated bronze rotary handle waste and S/S strainer plate with chrome plated brass connected overflow, standard-keil hardware company no. #1770-1015-1000.

NYIKOS ASSOCIATES, INC.
Food Facilities Design/Consulting

DESCRIPTION: COUNTER TOP SINKS

STANDARD DTL: 3.04
h. VERIFY: DUCTS OVER 60° SHALL BE CROSS CREASED FOR RIGIDITY.

1. D. w. i. DISHWASHER EXHAUST REQUIREMENTS. INCREASE DISHWASHER MANUFACTURERS CFM EXHAUST REQUIREMENTS FOR EACH VENT BY 50% TO ALLOW FOR AIR INDUCTION THROUGH DUCT VENTS.

c. EXHAUST DAMPER REQUIREMENTS. WHEN D.W. VENTS ARE NOT EQUIPPED WITH DAMPERS, EACH DUCT SHALL BE PROVIDED WITH AN 18 GA. 5/8 DAMPER AND LOCKING QUADRANT LOCATED BETWEEN THE LOUVERS AND D.W. VENT.

END OF SECTION 11 40 00
1.1 GENERAL

A. The Bidding and Contract Requirements and Division 1 - General Requirements for the Construction of this project shall apply to this division and all sections herein.

B. Where items under the Bidding and Contract Requirements, and Division 1 - General Requirements are repeated in this section, it is intended to call particular attention to or qualify the items. It is not intended that any other parts under the Bidding and Contract Requirements of Division 1 - General Requirements shall be assumed to be omitted if not repeated herein.

1.2 SCOPE

A. The work included under this Division shall include a complete plumbing system as shown on the drawings and as specified herein. Any apparatus, appliance, material or work not shown on the drawings but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the work complete in all respects and ready for operation, even if not particularly specified, shall be furnished, delivered and installed by the Contractor without additional expense to the Owner.

B. The Contractor shall note that all items of equipment are specified in the singular; however, the Contractor shall provide and install the number of items of equipment as indicated on the drawings and as required for a complete system.

C. It is the intention of the specifications and drawings to call for finished work, tested, and ready for operation. Wherever the word "provide" is used, it shall mean, "provide and install complete and ready for use."

D. Minor details not usually shown or specified but necessary for proper installation and operations shall be included in the Contractor's estimate, the same as if herein specified or shown.

E. This contractor shall be responsible for participation and coordination with the Commissioning process as specified in section 01660.

1.3 APPLICABLE SPECIFICATIONS, CODES, STANDARDS AND PERMITS

A. All equipment, materials and installation shall conform to the requirements of national, state and local codes, laws, ordinances, rules and regulations. All utility connections shall conform to the requirements of the local utilities.

B. Unless otherwise specified herein or shown on the contract drawings, the work and materials shall conform to the applicable requirements of the following codes, standards and regulations:
1. VUSBC Virginia Uniform Statewide Building Code
3. ICC International Code Council
5. ARI Air Conditioning & Refrigeration Institute
6. ASHRAE American Society of Heating, Refrigerating and Air Conditioning Engineers
7. ASME American Society of Mechanical Engineers
8. ASTM American Society of Testing Materials
9. NEC National Electrical Code
10. NFPA National Fire Protection Association
11. OSHA Occupational Safety and Health Association
12. SMACNA Sheet Metal and Air Conditioning Contractors National Association
13. U/L Underwriters Laboratories, Inc.
14. ANSI American National Standards Institute
15. AWS American Welding Society
16. NEMA National Electrical Manufacturer's Association
17. CISPI Cast Iron Soil Pipe Institute
18. IRI Industrial Risk Insurers
19. CAA Clean Air Act Amendment of 1990 (Title VI, Section 608)
20. CTI Cooling Tower Institute

C. Contractor shall give all necessary notices, obtain all permits and pay all Government taxes, fees and other costs, including costs for water, sewer, and gas connections or extensions including meters, in connection with his work, file all necessary plans, prepare all documents and obtain required certificates of inspection for work and deliver same to Owner before request for acceptance and final payment for work.

D. The Contractor shall be responsible for purchasing equipment and appliances that bear the label of an agency, as approved by the Department of Public Works and Environmental Services
(DPWES), Fairfax County. It shall be the responsibility of the Contractor to pay for any label testing of equipment or appliances that are installed without the label of a DPWES approved agency.

1.4 SHOP DRAWINGS

A. The Contractor shall submit eight (8) copies of the shop drawings to the Architect for review with ample time for checking prior to delivery of any of this equipment or material to the job site. The project's and the Contractor's names shall be on each submittal.

B. Shop drawings shall be submitted on all major pieces of equipment and material. Each item of equipment proposed shall be a standard catalog product of an established manufacturer. The shop drawing shall give complete information on the proposed equipment such as: capacity, size, construction, material, dimensions, arrangement, operating clearances, performance characteristics, weight and rating authority. Each item of the shop drawing shall be properly labeled, indicating the intended service of the material.

C. The Contractor shall, before submitting the shop drawings of the equipment to the Architect, check each item of the shop drawings to verify the proper equipment. Items to check shall include but not be limited to:

- Will equipment physically fit into space;
- Proper equipment for the job;
- Electrical characteristics;
- Voltage matches that of electric service;
- Proper arrangements for connections;
- Meets code requirements.

D. The shop drawings shall be neatly bound and submitted to the Architect with a letter of transmittal which shall list each item submitted with the manufacturer's name.

E. Review of the shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings have been reviewed, said review does not mean that drawings have been checked in detail; said review does not in any way relieve the Contractor from his responsibility or the necessity of furnishing material or performing work as required by the contract drawings.

1.5 EQUIPMENT DEVIATIONS

A. Where the Contractor proposes to use an item of equipment other than the prototype equipment (a specified manufacturer's equipment used as the basis of design) or that detailed on the drawings which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical or architectural layout, all such redesign and all new drawings and detailing required therefore shall be prepared by the Contractor at his own expense and be approved by the Owner and Engineer.

B. Where such deviation from the prototype equipment requires a different quantity and arrangement of materials and equipment, the Contractor shall furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit and any other additional equipment required by the system at no additional cost to the Owner.
1.6 QUALIFICATIONS FOR BIDDERS

A. The Contractor shall examine drawings and specifications relating to work of all trades and become fully informed as to the extent and character of work required and its relation to all other work in the project prior to submission of bid or prior to start of any construction covered by these specifications and drawings.

B. Before submitting bid the Contractor shall visit the site and examine all adjoining existing building, equipment and space conditions on which his work is in any way dependent, for the best workmanship and operation according to the intent of the specifications and drawings. Contractor shall verify dimensions and fully inform himself as to the nature and scope of the proposed work and also the conditions under which it is to be conducted. He shall report to the Owner any conditions which in his estimation might preclude him from installing his equipment and work in the manner intended and noted on the drawings and in this specification. Failure to take the above precaution will in no way relieve the Contractor from his obligations to provide the material and work as indicated and as specified without additional cost to the Owner or extension of completion time.

1.7 TEMPORARY FACILITIES

Are specified under Temporary Facilities, the General Conditions, Supplementary General Conditions, and Division 1. General requirements are hereby made a part of this section as fully as if repeated herein.

1.8 DRAWINGS

A. The drawings are diagrammatic, indicating general arrangement of work, and should not be scaled to establish location of work. The drawings show the size of piping and ductwork branches, risers and equipment, and must be followed. Where a change of location or method of running becomes necessary due to obstructions or other construction difficulties, such changes shall be made after securing approval of the Owner in writing and at no increase in amount of contract.

B. Decisions regarding any and all substitutions and options permitted by the specifications shall be submitted for approval to the Owner. Approval will only be recognized when in writing.

C. In finished spaces all piping and ductwork shall be concealed or run behind furring unless shown otherwise. Where concealing is not possible piping and ductwork may be exposed after obtaining the Owner's approval.

D. All horizontal piping and ductwork not run below slab on grade shall be run as close as possible to underside of floor and parallel to building lines. Maintain maximum headroom in all areas.

E. All vertical piping and ductwork shall be run as close to walls and partitions as practicable.

F. Coordination of all other trades prior to erecting any piping or ductwork is required to avoid conflict between various components of the building.
1.9 COOPERATION WITH OTHER TRADES

A. The Contractor shall give full cooperation to other trades and shall furnish in writing, with copies to the Owner, any information necessary to permit the work of all trades to be installed satisfactorily with the least possible interference or delay.

B. Where the work of the Contractor will be installed in close proximity to work of other trades, or where there is evidence that work will interfere with work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment. This Contractor shall prepare composite working drawings at a scale not less than 1/4" = 1'-0" clearly showing how his work is to be installed in relation to the work of the other trades. If the Contractor installs his work before coordinating with other trades or as to cause any interference with work of other trades he shall make necessary changes to his work to correct the condition without additional cost to the Owner.

C. The Contractor shall furnish to other trades as required all necessary templates, patterns, setting plans and shop details for the proper installation of the work and for the purpose of coordinating adjacent work.

D. Structural support elements, as shown on the drawings, shall be in place prior to the installation of piping or the setting of rooftop equipment. The contractor shall not install any piping or rooftop equipment until such elements are in place.

1.10 ELECTRICAL WIRING

A. The Contractor shall, regardless of voltage, furnish and install all temperature control wiring, all interlock wiring and equipment control wiring for the equipment that the Contractor furnishes unless otherwise noted. Division 16 will furnish and install power wiring to the mechanical equipment and make electrical connections unless otherwise noted on the drawings.

B. All electrical wiring furnished under the mechanical contract shall conform with Division 16.

1.11 FOUNDATIONS AND SUPPORTS

A. The Contractor shall provide all necessary foundations, supports, pads and bases required for mechanical equipment and any other equipment furnished under this contract, unless covered under the architectural or structural work.

B. For buried concrete or cast iron sewer piping installed in filled cuts over four (4) feet in depth the Contractor shall provide brick or approved equal supports or piers under piping and fittings with piers or supports extending to a depth to provide sufficient firm and adequate support to overcome the possibility of any deflection in the piping system.

C. For pumps, compressors and other rotating machinery and all equipment where foundations are indicated, furnish and install concrete pads 4" in height (unless otherwise noted) extending not less than 4" beyond equipment base in all directions. Equipment installed in areas other than slab on grade shall be installed with the appropriate vibration assembly.

D. Construction of foundations, supports, pads, bases and piers where mounted on the floor, shall be of the same materials and same quality of finish as the adjacent and surrounding flooring material.
1.12 SCAFFOLDING, RIGGING AND HOISTING

Unless otherwise specified, the Contractor shall furnish all scaffolding, rigging, hoisting, shoring and services necessary for erection and delivery into the premises for any equipment and apparatus furnished and shall remove same from premises when no longer required.

1.13 EXCAVATION AND BACKFILL

A. The Contractor shall be responsible for excavation, backfill, tamping, shoring, bracing, pumping, street cuts, repairing of finished surface and all protection for safety of persons and property as required for installing a complete mechanical/plumbing system. All excavation and backfill shall conform to the architectural section of the specifications.

B. It shall be the responsibility of the Contractor to check the indicated elevations of utilities entering and leaving the building. If such elevations require excavations lower than the footing levels, the Owner shall be notified of such conditions and redesign shall be made before excavations are commenced. It is also the responsibility of the Contractor to make the excavations at the minimum required depths in order not to undercut the footings.

C. The pipe elevation shall be determined by the Contractor to meet the plumbing codes.

D. The trench shall be excavated below the installation level of the bottom of the pipe. The trench shall be filled with sand or fine gravel so entire length of barrel of piping rests on solid bed of sand or fine gravel. The backfill shall be filled in layers of 6" max depth and such layers shall be compacted after each placement.

E. Excavation shall be made in a manner to provide a uniform bearing for pipes. The pipe elevation shall be determined by the contractor to meet the plumbing codes. Where rock is encountered, excavate 3" below pipe grade and back fill with sand to the installation level of the pipe. The pipe, including the joints, shall not rest on rock at any point.

F. After required test and inspections, backfill the ditch and tamp. The first foot above the pipe shall be hand backfilled with rock free clean earth. The backfill in the ditches on the exterior and interior of the building shall be tamped to 95% of the standard Proctor maximum dry density (ASTM D-698). The Contractor shall be responsible for any of his ditch walls that cave in.

1.14 CUTTING AND PATCHING

A. On new work the Contractor shall furnish sketches showing the locations and sizes of all openings and chases, and furnish and locate all sleeves and inserts required for the installation of the mechanical work before the walls, floors and roof are built. The Contractor shall be responsible for the cost of cutting and patching where any mechanical items were not installed or where incorrectly sized or located. The Contractor shall do all drilling required for the installation of his hangers.

B. On alterations and additions to existing projects, the Contractor shall be responsible for the cost of all cutting and patching unless otherwise noted.
C. No structural members shall be cut without the approval of the Owner, and all such cutting shall be done in a manner directed by him. All patching shall be performed to match the existing surface in shape, texture and color.

1.15 ACCESSIBILITY

A. The Contractor shall locate equipment which must be serviced, operated or maintained in fully accessible position. Equipment shall include but not be limited to: valves, traps, or low limit devices, damper operators, motors, controllers, drain points, fusible links of fire dampers, fire dampers, filters, etc. If required for better accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility, and any change shall be approved. Motor starters shall be installed not more than 6'-0" above finished floor unless otherwise approved by the Owner.

B. All filters furnished with air handling equipment shall be readily removable from sides or bottom of cabinet as required by equipment location. Contractor shall verify location of all equipment and proper location of access to filters for removal before submitting shop drawings, placing order for equipment and setting and connecting of equipment. Any filters deemed by the Owner to be inaccessible after installation will be made accessible by the contractor at no additional cost to the Owner.

1.16 RECORD DRAWINGS

The Contractor shall keep daily updated accurate records of all deviations in work as actually installed from work indicated on the contract drawings. The record drawings shall be kept at the job site, available to the Owner at all times and labeled as "Project Record Information - Job Set". When work is completed one complete set of marked-up prints shall be delivered to the Owner.

1.17 PERSONNEL INSTRUCTION AND OPERATING INSTRUCTIONS

A. The Contractor shall submit for approval three (3) copies of all of the manufacturer's installation, operating and maintenance manuals for all new mechanical equipment listed in the equipment schedule, all necessary components of mechanical equipment, testing and balancing reports, equipment start-up records, equipment capacity (input and output) and a list of filter sizes and belt sizes for all mechanical equipment that requires filters and belts (this includes, but is not limited to, fan coils, unit ventilators, rooftop units, cabinet heaters, exhaust fans and air handlers). Submit four (4) copies of the operating and maintenance manuals for the automatic temperature control system components and diagrams for approval. A complete written narrative of how each system is intended to operate shall be included. Manuals shall be assembled in black vinyl hardback loose-leaf binders, labeled with job name, address and date. Information on each piece of equipment of system shall be in a separate tab labeled section. Provide a complete index of the contents. After approval by the Engineer the binders shall be forwarded to the Owner.

B. After all tests are conducted and approved as specified below, furnish a competent operating engineer for a period of two days to instruct and demonstrate to the Owner or his authorized representative the operation of the system. The mechanical systems demonstration shall not coincide with the electrical demonstration. Notify the Owner in writing of the person to whom this instruction was given and the date it was given.
C. On phased construction projects the aforementioned equipment start-up records shall be completed and made available to the Owner for review prior to the occupancy of the completed phase.

1.18 TESTS

A. The Contractor shall, at his expense, conduct capacity and general operating tests on each system. The test shall demonstrate the specified capacities of the various pieces of equipment and shall be conducted in the presence of the Owner or his authorized representative. The general operating tests shall demonstrate that the entire equipment is functioning in accordance with the contract documents. Furnish all instructions and test equipment.

B. After all systems are completely tested, submit three (3) copies of the test results to the Owner for approval before final acceptance of project.

1.19 EQUIPMENT AND SYSTEMS CHECKOUT AND START-UP

A. This contractor is responsible for the checkout and start-up of all equipment and systems. Equipment start-up shall be in accordance with the manufacturer’s requirements and recommendations and shall be performed by personnel who are knowledgeable with the equipment and its requirements. When required by the equipment manufacturer or as noted in the specifications, equipment checkout and start-up shall be performed by personnel certified by the manufacturer. Evidence of proper certification of startup personnel shall be provided to the Owner.

B. All checkout and start-up activities are the responsibility of this contractor.

C. This contractor shall notify FCPS two weeks prior to equipment checkout and start-up.

D. Systems and equipment shall be operated at both full and part load conditions to ensure specified requirements can be achieved.

E. The equipment manufacturer's checkout and start-up logs shall be completed in their entirety, should a reference be non-applicable it shall be marked as such. Copies of completed logs shall be submitted to FCPS personnel the day of checkout and start-up activities, as well as included in the Operation and Maintenance manual.

1.20 WARRANTY

The Contractor shall deliver the work described herein in a first-class operating condition in every respect. The Contractor shall also warrant that the material, equipment and workmanship furnished shall be entirely free from defects for a period of one year. All apparatus will develop capacities and characteristics specified, and that if during the period of one year - from date of substantial completion any such defects in workmanship, materials or performance appear, he will, without cost to the Owner, remedy such defects within a reasonable time. In default thereof, Owner may have such work done and charge the cost to the Contractor. In cases where equipment warranties through the manufacturer exceed the periods listed in these specifications, the manufacturer's warranty shall take precedence. The Contractor is responsible for all periodic service and maintenance required to maintain such warranties on completed work for the duration of the project. Once the entire project is substantially complete, periodic
maintenance shall be the responsibility of the Owner.

1.21 CONNECTING INTO EXISTING UTILITIES

A. Procedures: The procedures used for the accomplishment of connecting into existing work shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services.

B. Scheduling of Work: Work shall be performed in the sequence, locations and time periods agreed to by the Owner prior to commencement of work.

C. Dust Control: The amount of dust resulting from connecting existing utilities shall be controlled to avoid creation of a nuisance in the surrounding area. Masks shall be worn for protection against dust inhalation by all persons in the vicinity of work involving removal of masonry.

D. Protection of Existing Work:

1. Existing work and furnishings to remain shall be protected from damage. Work damaged by the Contractor shall be repaired to match existing work without any additional cost to the Owner.

2. Cover equipment as necessary, to protect it from dust.

3. Floors shall be protected from damage.

4. At the end of each work day and during inclement weather, close exterior openings with weather-proof cover.

5. Provide temporary filter media on any portions of existing ductwork which communicate with corridors and construction areas. This media shall be checked frequently and changed as necessary.

E. Environmental Protection: Contractor shall comply with all Federal and local regulations pertaining to Environmental Protection.

F. Removal of Existing Equipment and Materials: Existing equipment and materials shall be dismantled and/or cut-up so as to be removable through existing building's access passages. No alterations to the building shall be made for the purpose of removing existing equipment and material.

G. Clean-up:

1. Debris and Rubbish: Remove debris and rubbish from the site daily. Do not allow to accumulate in building or on site.

2. Debris Control: Remove and transport debris in a manner so as to prevent spillage on site or adjacent areas.

3. Regulations: Local regulations regarding hauling and disposal shall apply.
1.22 DOWNTIME

A. The Contractor shall so arrange his work that domestic water, gas, storm sewer, sanitary sewer, air conditioning, and heating systems shall be maintained at all times while the school classes are in session.

B. The Contractor shall submit written requests to disconnect any existing utility services and to obtain equipment downtime. Only after receiving Owner approval of these requests shall work be allowed to proceed. This Contractor shall be responsible for restoring the existing utilities.

1.23 CONSTRUCTION LIMITATIONS

In renewal projects which require work to be continually done, above the corridor ceilings, while school is in progress. The following requirements shall be met:

A. No construction material may be stored in a corridor at any time.

B. Any work done in the corridors after school hours must allow a minimum corridor of 72" to remain for safe egress. No work such as welding, soldering, etc., which is considered hazardous to the occupants of the building, may take place during school hours.

C. The Contractor shall immediately clean any area of debris, if work is done in any occupied space.

D. No gas powered construction equipment will be allowed in the building during school hours.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL

The Bidding and Contract Requirements, Division 1 - General requirements and section 22 0110 - General Provisions, shall apply to this section.

1.2 SCOPE

The work covered under this section covers the basic materials and methods for a complete mechanical system.

PART 2 - PRODUCTS

2.1 PIPE AND PIPE FITTINGS

A. All materials shall be of an approved type and shall be designed for the pressures and temperatures at which they are to be operated, for the materials they are to handle and for their intended use.

B. Materials shall conform to the standard reference numbers listed below. See individual sections of the specifications for use.

1. Ductile Iron Water Pipe - (Water Service) - AWWA C151.
2. Copper Tubing (Water Distribution - Type L or K) - ASTM B75; ASTM B88 or B251
3. Cast Iron Fittings - ASME B16.4, B16.12; ASTM A74, A888; CISPI 301
5. Cast Iron Soil Pipe - ASTM A74; ASTM A888; CISPI 301
6. Copper Pipe (Waste, Vent, & Hydronic) - ASTM B42; ASTM B302
7. Galvanized Steel Pipe (Waste & Vent) - ASTM A53
8. Polyvinyl Chloride (PVC) Plastic Pipe - ASTM D2665 or D2949
10. Concrete Pipe - ASTM C14; ASTM C76
11. Steel Pipe - ASTM A53, A106
13. Steel Butt Welding Fittings - ASME B16.9
14. Steel Fittings - ASTM A420
15. Gray Cast Iron Fittings - ASTM A126
16. Steel Pipe Flanges - ASME B16.5

2.2 PIPING SPECIALTIES

Piping Specialties shall be designed and installed to meet the intended use including pressures and temperature.

A. Gaskets - Shall be full face with a working pressure of 300 lbs. and temperature up to 212°F. Gaskets shall be manufactured by JM CLIPPER, US PIPE, FNW, or AMERICAN.

B. Strainers - HONEYWELL-BRAUKMAN, ARMSTRONG, or SARCO.

C. Unions
   1. Unions shall be of an approved type, shall meet the requirements for the pressure and temperature at which they are to operate and shall be compatible with the pipe materials.
   2. Brass Couplings - Shall be used for connecting steel pipe to copper tubing.
   3. Di-electric unions or waterways shall not be permitted.

D. Escutcheons - Escutcheon plates shall be stamped brass chromium plated, shall be of sufficient size to cover sleeved openings for the pipes, shall be of sufficient depth to cover sleeves projecting above floors and shall be manufactured by BLATON AND CALDWELL, DEARBORN BRASS, MASON, or GRINNELL.

E. Gauges and Thermometers - Shall be as listed below unless otherwise specified under other sections of the specifications.
   1. Temperature Gauges or Thermometers - Shall be the separable socket, adjustable angle type, not less than 9" scale V-shaped, organic filled, blue reading column. Range shall be applicable for the service. Thermometers shall be adjustable type to permit easy reading from floor and outside of insulation, as manufactured by ASHCROFT, WEKSLER, TAYLOR or TRERICE.
   2. Pressure Gauges - Shall be of the liquid filled bourdon-tube type with dial diameter not less than 4" and operating range 0 - 160 psig. Install a shut-off cock in line to each gauge. Gauges as manufactured by ASHCROFT, WEKSLER, TAYLOR, or TRERICE.
3. Compound Gauges - Shall be of the liquid filled bourdon-tube type with dial diameter not less than 4" and operating range 30" - 0 - 30 psig. Install a shut-off cock in line to each gauge. Gauges as manufactured by ASHCROFT, WEKSLER, TAYLOR, or TRERICE.

2.3 PIPE HANGERS AND SUPPORTS

A. Pipe Hangers and Supports Material - Provide a combination of pipe hangers and supports such as steel and copper clad clevis hangers, round steel rods, concrete inserts, clamps, brackets and other items as applicable. Hangers and supports shall meet the recommendations of the manufacturer. Parallel runs of horizontal piping shall be grouped together on adjustable trapeze hangers. All hangers in contact with copper pipe shall be copper plated. Pipe hangers and support shall be of the size to accommodate the pipe and insulation where applicable. Pipe hangers and supports manufacturer: MASON, GRINNELL, NIBCO, ANVIL or CARPENTER & PATERN.

B. Hanger Spacing for Horizontal Pipe shall not exceed:

1. Cast Iron Soil Pipe (all diameters) 5'-0"
2. Plastic Pipe (all diameters) 4'-0"
3. Schedule 40 Steel Pipe
   1/2" to 1" Pipe 6'-0"
   1-1/4" to 2" Pipe 8'-0"
   2-1/2" to 4" Pipe 10'-0"
   5" and Larger Pipe 12'-0"
4. Type ‘L’ Copper Tubing
   1/2" to 3/4" Pipe 5'-0"
   1" Pipe 6'-0"
   1-1/4" Pipe 7'-0"
   1-1/2" to 2" Pipe 8'-0"
   2-1/2" Pipe 9'-0"
   3" Pipe 10'-0"
   3-1/2" Pipe 11'-0"
   4" Pipe 12'-0"
   5" Pipe 13'-0"
   6" Pipe 14'-0"

C. Hanger Spacing for Vertical Pipe shall not exceed:

   Cast Iron Soil Pipe At the base and at each story
   Threaded Pipe At each story
   Plastic Pipe At each story and at the midpoint between floors
   Copper Tube At each story

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D. Hanger Rods shall be at least:
- Pipe to 2"  3/8" diameter
- 2-1/2" to 3"  1/2" diameter
- 4" to 5"  5/8" diameter
- 6" to 8"  3/4" diameter
- 10" to 12"  7/8" diameter

E. Sheet Metal Saddles - Supports for insulated pipes shall not contact the pipe but shall surround the unbroken covering. Provide galvanized steel sheet metal saddles properly formed to the jacket between hanger and the lower 1/3 of the circumference. The size of the saddles shall be as follows:
- Pipe to 3"  24 gauge x 12" long
- 4" to 6"  18 gauge x 12" long
- 8" and larger  16 gauge x 12" long

2.4 VALVES

A. Valves shall be of an approved type and shall meet the requirements for the pressure and temperature at which they are to be operated, for the material they are to handle and for their intended use. Valve manufacturers are listed in the individual sections of the specifications.

B. Valve and Tag Chart - Furnish and install on each valve a brass tag with a number and the abbreviation PLMB (for plumbing) embossed in the brass tag for each valve and securely fastened to each valve wheel with beaded chain or brass wire. Provide a laminated chart in the water heater room, showing the locations and use of each valve. Laminating film shall be at least 10mil thick. Two charts shall be provided - one for the plumbing valves and one for the heating and cooling valves. The plumbing valves shall start with number 1 and continue consecutively until all plumbing valves are numbered. The heating and cooling valves shall start with number 1 and continue consecutively until all heating and cooling valves are numbered. A copy of the valve tag charts shall also be contained in the Operation and Maintenance Manual.

2.5 ACCESS DOORS

The Contractor shall furnish access panels not smaller than 16 X 16" for access to concealed valves, traps, dampers, etc. where no other means of access is provided. Access panels shall be all steel construction with no. 16 gauge wall or ceiling and no. 14 gauge panel door with not less than 1/8" insulation secured to inside of the door. Doors shall be supported with concealed hinges and secured with suitable clips and countersunk flush screws. Outside of access panels shall be flush with finished wall or ceilings, except that where panels are located in acoustic tile or paneling, the door shall be recessed to receive adjacent finish material. The Contractor shall determine the final position of each access door and the size to be used. Access panels shall be as manufactured by MILCORS. Fire ratings of access door shall not be less than the surface on which the door is installed. Where locking access doors are required by specifications, doors shall be fitted with an HL302 lock cylinder and key.

2.6 ELECTRIC MOTORS

A. The Contractor shall provide and install all electric motors for equipment furnished under
Division 15. All motors shall be NEMA standard design for quiet operation. The motors shall be of ample size to operate at their proper load and full speed continuously without causing noise, vibration or temperature rise in excess of the rating. Provide high efficiency motors when called for on the drawings or hereinafter specified.

B. Motors with belted drives shall be mounted in a manner to allow for belt adjustment. All belts shall be adjusted before turning project over to owner. All motors with belt drives shall have belt guards.

2.7 ELECTRIC MOTOR STARTERS

The contractor shall furnish all motor starters complete with lugs sized to receive conductors specified and with accessories as required such as stop-start push button switches, hand-off-auto selector switches, pilot lights, remote switches, auxiliary contacts, transformers, relays, fuses and overload thermal units or heaters. Contractor coil voltage shall be 24 volts. All components are to be housed within enclosure.

A. The motor starters shall be the type to meet the requirements of the motor and shall be in accordance with NEMA Standards, sizes and horsepower ratings. The starters shall be manufactured by SQUARE D', GENERAL ELECTRIC, CUTLER-HAMMER or SIEMENS.

B. Three phase motors shall have across-the-line magnetic starter and single phase motors shall have manual starters. The starters shall have NEMA 1 enclosures unless otherwise noted or required. Outdoor starters shall have weatherproof enclosures.

C. The starter shall have an overload thermal unit in each phase conductor. The thermal units shall be sized as recommended by the manufacturer for full protection of the motor.

D. All three phase motors and equipment with compressors shall be provided with three phase motor protectors as manufactured by DIVERSIFIED, SLM-ASE series (match voltage to corresponding model number). Unit shall include range plug, output fuse, output switch, line adjustment, status/trouble lights and adjustable/selectable operation with built-in time delays. Unit shall be U/L labeled. Protectors as manufactured by TIMEMARK #265 or MOTECTOR Power Guardian PLUS shall also be acceptable.

2.8 EQUIPMENT

A. Equipment shall be furnished and installed as listed in the specifications or as required for a complete project.

B. All equipment shall be new and shall bear the manufacturer's name and trade name. The equipment furnished under each section of the specifications shall be essentially the standard product of a manufacturer regularly engaged in the production of the required type of equipment.

C. All three phase equipment and equipment with compressors shall be provided with three phase motor protectors as manufactured by DIVERSIFIED, SLM-ASE series (match voltage to corresponding model number). Unit shall include range plug, output fuse, output switch, line adjustment, status/trouble lights and adjustable/selectable operation with built-in time delays. Unit shall be U/L labeled. Protectors as manufactured by TIMEMARK #265 or MOTECTOR Power Guardian PLUS shall also be acceptable.
PART 3 - EXECUTION

3.1 PIPE, FITTINGS AND JOINTS

A. Pipe and Fittings

1. Pipe, fittings and specialties stored at the job shall be stored in such a manner as to prevent dirt and moisture from collecting in the material. Openings in the piping system during construction shall be protected at all times from foreign matter entering the piping system. PVC piping shall not be stored in direct sunlight.

2. Installation - The piping shall be installed complete and shall be of the size required by code. When a size is not indicated or is in conflict with other drawings, the Contractor shall request the pipe size from the engineer. All piping shall be cut accurately from dimensions established at the project site and allowances shall be made for the clearance of windows, doors and other openings. No part of the building structure may be cut to allow for the installation of piping unless specifically approved in writing.

3. All piping shall be installed parallel or perpendicular to the building construction and shall be installed so as to allow for expansion and drainage. Due to the small scale of the drawings, it is not possible to show all elbows and swing joints required to allow for expansion; however, the Contractor shall install three (3) elbow swing joints at all runouts and other connection to mains.

4. Install continuous galvanized sheet metal drip pan under all water piping passing through all rooms with electrical equipment such as electrical, elevator equipment and transformer rooms and all other spaces provided primarily for the installation of electrical equipment. Drip pan shall be channeled out of the space and be extended to the closest drain.

5. Eccentric reducing fittings or eccentric reducing couplings shall be installed to bring top of mains in line and prevent pockets. Eccentric fittings will not be required on water mains. Ends of pipes shall be reamed out before being installed.

6. Pipe Sleeves

   a. Pipe sleeves shall be installed on all pipes passing through walls, ceilings and floors except floor slabs on grade. On insulated pipes the sleeves shall be large enough to pass the insulation without damaging the vapor barrier. The ends of the sleeves shall extend ½” above the finished floor and made watertight around sleeve. Where pipes pass through fire rated floors and walls the space between the pipe and the sleeve shall be firestopped and smokestopped with the appropriate U/L rated assembly. Sleeves not in contact with the earth shall be schedule 40 black steel pipe, except sleeves in poured concrete slabs above grade may be a manufactured pipe sleeve. PVC sleeves shall not be used in plenum spaces.

   b. Pipe Sleeves in contact with the earth shall be cast iron. The space between the
pipe and the cast iron pipe sleeve shall be packed with oakum with a lead joint and made watertight. The pipe passing through and under footings and wall below grade shall have cast iron sleeves. The sleeves not entering the building need not be watertight.

B. Piping Joints

1. Screwed Joints - Screwed joints shall be made with full cut American Standard Pipe Thread. All pipes shall be reamed to full diameter of the pipe. Pipe thread compound shall be applied to the male thread only.

2. Welded Joints

a. Welded joints for steel pipe 2-1/2" and larger shall be made in accordance with the procedure standard in the American Standards Association piping code, and before assigning any welder to work covered, the Contractor shall provide for the approval of the name(s) of pipe welders to be employed in the work, together with certification that each of these welders has passed qualification tests as prescribed by the National Certified Pipe Welding Bureau or by other reputable testing laboratory or agency using procedures approved by the ASME or American Welding Society. The Contractor shall use only approved factory manufactured welding type fitting for the intersection welding or branching to mains. Valves and specialties shall have screwed or flanged joints.

b. Welding tees, ells, reducers and caps shall be of wrought or forged construction similar to those manufactured by TUBE TURNS, INC. In lieu of wrought or forged welding tees for branch outlets, weldolets or welding nipples may be used; provided, first that the nipples are accurately coped in the shop to fit the pipes and leveled for field welding; and provided, second that openings in the walls of pipes are cut to full inside diameter of the nipples; and third, that the outlet diameter shall be less than 3/4 the diameter of the main.

c. For connections on welded piping to valves 2 1/2" and over and that of other accessories required to be flanged, weld neck or slip-on companion flanges shall be used. The flange face shall be in every case perpendicular to the axis of the pipe valve.

3. Solder Joints - The solder joint above grade shall be made, unless otherwise noted, with 95/5, lead free solder using approved flux. All underground joints and refrigeration joints shall be made with an approved silver bearing solder. Cut pipe shall be reamed to full diameter. Copper to steel pipe shall be made with proper fittings.

4. Cast Iron Pipe Joints - For bell-and-spigot soil pipe the joint shall be firmly packed with oakum and filled with molten lead not less than 1" deep and not to extend more than one-eighth inch below the rim. The use of a neoprene gasket when installed in accordance with the manufacturer's recommendations is also acceptable.

5. Concrete Pipe Joint - Shall be bituminous joint compound or a cement plaster installed in
accordance with the manufacturer's recommendations. Joints firmly packed with oakum and filled with a concrete mortar which shall extend mortar to 3” beyond the hub shall also be acceptable. All joints shall be made with precast concrete fittings.

6. Flanged Joint - The flanged joint shall be made with the proper number and size of bolts and with the proper gasket between the flanges.

7. Plastic Pipe Joints - Shall be made with solvent as recommended by the pipe manufacturer.

3.2 PIPE SPECIALTIES

A. Pipe specialties shall be installed as indicated in the specifications and as required to make a complete system.

B. Escutcheon Plates shall be mounted on all exposed pipes extending through wall, floor, ceiling or cabinet bases. On insulated pipes the escutcheon shall be on the outside of the insulation.

C. Pressure and Compound Gauges shall be installed with shut-off cock in the line to each gauge.

3.3 PIPE HANGERS AND SUPPORTS

A. All pipes shall be supported from the building structure, and wherever possible, parallel runs of horizontal piping shall be grouped together on adjustable trapeze hangers. Single runs of horizontal piping shall be supported with clevis type hangers. The hangers shall be on the outside of the insulation. Vertical risers shall be supported at each floor line with steel pipe clamps. All hangers in contact with copper pipe shall be copper plated. The use of wire or perforated metal to support pipe will not be permitted. In no case shall copper pipe be in contact with a ferrous metal.

B. The pipe hanger spacing and support shall be as listed under 2.03 in this section.

C. Where piping is supported from the steel, the support shall be attached at the top of the steel. Attachments shall be made either by welding or using top beam clamps.

D. Any supplemental steel required between building structural members shall be provided by this contractor.

3.4 VALVES

A. The Contractor shall install valves where indicated on the drawings and where required for adequate control of the system. Provide shut-off valves at the base of the risers and main branches at points of take-offs from the supply or return mains. Branches shall be considered main branches when they serve three or more units or fixtures. Provide valves necessary to isolate each piece of equipment separately from the remainder of the system. Valves shall be installed in accessible locations. Allow isolation for inspection, maintenance and repair of each piece of equipment and each service loop. Provide valves to allow for the phasing of work where required. Valve size shall be the same as the pipe size except for control valves.
B. Valves shall be installed with their stems in an upright or horizontal position. Stems shall not be inverted.

C. After approval of a particular valve, this type valve shall be used throughout the project. Do not mix styles or manufacturers.

D. Ball valves shall be provided with a 2" extended handle of a non-thermal conductive material and shall include a protective sleeve that allows operation of the valve without breaking the vapor seal or disturbing the insulation. Extended handle shall be internally insulated.

3.5 ACCESS DOORS

Install hinged and lock type access doors as required for operation and maintenance of equipment. The access doors shall be installed so that they maintain the rating integrity of the material in which they are mounted. Those with an exposed surface in a finished area shall be flush with the finished material with a recessed space for installation of flush matching materials when in panel or acoustical tile.

3.6 ELECTRIC MOTORS

Electric motors shall be supplied with equipment furnished under Division 15. All moving parts shall be protected as required by OSHA.

3.7 ELECTRIC MOTOR STARTERS

A. Electric motor starters and accessories shall be installed under Division 16.

B. Three phase motor protectors shall be installed in accordance with manufacturers recommendations and installation instructions. Unit shall be selected for voltage specified.

3.8 EQUIPMENT

A. The Contractor shall receive and properly store the equipment pertaining to the mechanical work. The equipment shall be tightly covered and protected against dirt, water, chemical or mechanical injury and theft. The manufacturer's directions shall be followed completely in the delivery, storage, protection and installation of all equipment and materials.

B. The Contractor shall provide and install all items necessary for the complete installation of the equipment as required by code without additional cost to the owner, regardless of whether the items are covered in the specifications. Such items could be - but are not limited to: concrete pad, supports, vibration eliminators, additional piping and valves, motor controllers, relief valves and piping, insulation, electrical wiring, lubrication, refrigerants and start-up and service.

C. It shall be the responsibility of the Contractor to clean the equipment, make necessary adjustments and place the equipment into operation before turning equipment over to the Owner. Any paint that was scratched during construction shall be touched-up with factory color paint. Any items that were damaged during construction shall be replaced.

D. Where equipment is supported from the steel, the support shall be attached at the top of the steel. Attachments shall be made either by welding or using top beam clamps.
E. Three phase motor protectors shall be installed in accordance with manufacturer’s recommendations and installation instructions. Unit shall be selected for voltage specified. Motor protectors shall be installed prior to start-up.
PART 1 - GENERAL

1.1 GENERAL

The Bidding and Contract Requirements, Division 1 - General Requirements, section 22 01 10 - General Provisions and section 22 0130 - Basic Materials and Methods, shall apply to this section.

1.2 SCOPE

The work covered under this section shall include providing and installing the insulation on the items listed in this section or as shown on the drawings.

1.3 QUALITY ASSURANCE

All insulation shall have a composite fire hazard rating as tested by ASTM E-84, NFPA 25 or UL 723 not to exceed 25 flame spread, 50 smoke developed and 50 fuel contributed.

1.4 SUBMITTALS

Provide shop drawings on proposed insulation as described in section 15010 - 1.04. Shop drawings shall include proposed uses of all insulation components.

PART 2 - PRODUCTS

2.1 GENERAL

The manufacturer of the products specified in this section shall be OWENS-CORNING, CERTAIN-TEED, JOHNS-MANVILLE, ARMSTRONG, MANSON or KNAUF.

2.2 PIPING INSULATION

A. The piping shall be insulated with heavy density rigid molded fiberglass pipe insulation with factory applied all service jacket (ASJ) with a 'K' factor not to exceed 0.25 @ 75°F mean temperature. The minimum insulation thickness for the various items shall be as follows:

1. Domestic Cold Water Piping and Cold Water Makeup Piping - 1/2". Exceptions: Exterior walls and plumbing chases shall be 1".

2. Trap Primer Supply Piping - 1/2" elastomeric, expanded closed cell, seamless pipe insulation from the drain tap to the trap primer valve or distribution unit.

3. Domestic Hot Water, Tempered Water and Hot Water Recirculating Piping -1”. Exceptions: Fixture runouts in interior plumbing chases and walls may be 1/2".
4. Storm Water (includes main and overflow piping) - The horizontal section of the rain leaders, riser to and including the interior part of the roof drains shall have 1" of insulation. The drain body and sump receiver of the roof drain shall have 1" of rigid fiberglass board insulation. Above slab piping serving open site drains shall have 1" pipe insulation from the open site drain to the rain leader.

5. Domestic water piping in the cells of masonry walls shall have be polyolefin pipe insulation such as "IMCOLOCK" with a ½ inch wall thickness.

B. Sheet Metal Saddles - See section 15050 - 2.3.

C. Finish - Exposed Piping - Cover with 8 oz. canvas jacket.

1. Exposed piping in the kitchen shall be insulated per the specification and covered with a PVC jacket 20 mil thick, white in color, washable and approved by the USDA and the FDA.

2.3 PIPING FITTINGS, VALVES AND SPECIALTIES INSULATION

A. Fittings, valves and specialties for the piping systems shall be insulated by two piece molded fiberglass fittings with an insulating value equivalent to the pipe insulation. Acceptable alternative insulation methods shall be as described in paragraph 3.2 D.

B. The following piping fittings, valves and specialties shall be insulated.

1. Domestic cold water piping

2. Domestic hot water, tempered water, and hot water recirculating piping

C. Finish - Insulation on exposed piping fittings, valves and specialties shall be covered with an 8 oz. canvas jacket.

PART 3 - EXECUTION

3.1 GENERAL

A. All insulating material shall be installed in accordance with the manufacturer's recommendations by personnel regularly employed in the pipe, duct and equipment insulating trade.

B. The insulation shall not be applied until all surfaces are clean and dry and until inspected and released for insulation application.

C. A complete moisture and vapor seal shall be provided on cold surfaces where vapor barrier jackets or coatings are required. Anchors, hangers, and other projections shall be insulated and vapor sealed to prevent condensation.

D. Pipe or duct insulation shall be continuous through walls and floor openings except where walls or floors are required to be firestopped or required to have a fire resistance rating.
3.2 PIPE INSULATION APPLICATION

A. Pipe insulation shall be installed in accordance with the manufacturer's instructions.

B. Piping (except refrigeration piping) - Butt all joints firmly together. Ends of pipe insulation shall be sealed off with a vapor barrier coating at all fittings and valves. The insulation laps and butt strips shall be sealed by one of the following methods:

1. Insulation without self-seal laps shall have lap adhesive manually applied to all laps and butt strips. Stapling is not acceptable.

2. Insulation with self-seal laps shall have lap adhesive manually applied to the outside of all laps and butt strips after installation. Stapling is not acceptable.

C. Refrigeration piping and domestic water piping using closed cell insulation - Butt joints and seams shall be joined together with contact adhesive Prototype-Armstrong 520 or manufacturer's recommended adhesive. Both surfaces to be joined shall be coated with the adhesive.

D. Fittings and Valves - Shall be insulated with molded fiberglass fittings, segments of pipe covering, or with firmly compressed foil faced fiberglass blanket. Mitered joints are not acceptable. Secure in place with 20 gauge corrosion resistant wire and apply a smoothing coat of insulating cement. Vapor seal by applying a layer of open weave glass cloth fabric embedded between flood coats of vapor barrier mastic. Lap glass fabric 2 inches onto adjacent pipe. PVC covers are acceptable only if the item covered is fully insulated first. Insulation shall be installed so the cover cannot be deformed. Contractor shall request an inspection by the Owner of the insulated items prior to cover installation.

E. Finish - All exposed piping, and piping fittings, valves and specialties insulation shall receive an 8 oz. canvas jacket smoothly pasted in place with lagging adhesive and sized with one brush coat of lagging adhesive. The finished surface shall be suitable for painting. Exposed piping includes piping in accessible attics, equipment mezzanines, boiler rooms, and equipment rooms.

F. Outdoor Piping - Weatherproofing Finishes For All Outdoor Insulation.

1. Piping - Apply aluminum metal jacket 0.016" with moisture barrier around pipe and slip edge into preformed Z lock positioned to shed water. Butt next jacket section leaving approximately 3/8" gap. Place preformed 2" butt aluminum band and wing seal.

2. Fittings - Apply prefabricated metal fittings in composition to pipe jacketing.

G. Sheet Metal Saddles shall be provided and installed on all pipe hangers as stated under section 15050, 2.3.

END OF SECTION
SECTION 22 11 16

DOMESTIC WATER PIPING SYSTEM

PART 1 - GENERAL

1.1 GENERAL

The Bidding and Contract Requirements, Division 1 - General Requirements, Section 22 0110 - General Provisions, and Section 22 0130 - Basic Materials and Methods shall apply to this section.

1.2 SCOPE

The work covered under this section shall include a complete domestic water piping system.

1.3 QUALITY ASSURANCE

A. All water piping shall be tested for leaks before the insulation is applied and before the piping is covered up. The test shall be at least 100 psi of water pressure for duration of 12 hours.

B. All grooved couplings, fittings, valves and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

C. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

1.4 SUBMITTALS

Provide shop drawings on all piping and valves as described in Section 15010 - 1.04.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Water Service Piping - Shall be class 150 ductile iron lined tar coated piping with mechanical or slip joints.

B. Water Piping below Grade - Shall be type 'K' soft drawn copper tubing with 125 psi wrought copper sweat fittings soldered with silver solder.

C. Water Piping below Grade (trap primer supply) - Shall be type 'K' soft drawn copper continuous tubing.

D. Water Piping above Grade - Shall be one of the following:
1. Type 'L' hard drawn copper tubing with 125 psi wrought copper sweat fittings and all joints soldered with 95/5 or silver solder.

2. The use of mechanically formed tee connections is acceptable. Branches shall be formed up to the run tube size as shown in ASTM 2014. Forming procedures shall be in accordance with tool manufacturer's recommendations.

3. Exposed water piping to plumbing fixtures - Shall be chrome plated brass piping and fittings and chrome plated standoff hangers

2.2 VALVES

Valves shall be manufactured by CONBRACO INDUSTRIES, INC., APOLLO VALVES, NIBCO, VICTAULIC, STOCKHAM, JENKINS, HAMMOND, MILWAUKEE, FAIRBANKS, CRANE, WATTS, or JOMAR. All valves shall be certified to be lead free in accordance with NSF/ANSI 61 section 8, which states that the wetted surfaces of all plumbing valves shall have a weighted-average lead content of no more than 0.25%.

A. Gate valves 2-1/8" and smaller - Shall be sweated bronze gate valves with screw-in bonnet, rising stem, solid wedge and a minimum rating of 200-pound wog.

B. Gate valves larger than 2-1/2" - Shall be flanged ductile iron body OS & Y gate valve with stainless steel or bronze trim, ductile iron wedge and a minimum rating of 125 psi and 200-pound wog.

C. Check Valves 2½" and smaller - Shall be sweated bronze, horizontal swing check valves with solid bronze discs and a minimum rating of 200-pound wog.

D. Check Valves larger than 2½" - Shall be flanged ductile iron, horizontal swing check valves with stainless steel or cast iron disc and a minimum rating of 200-pound wog.

E. Balancing Valves: Valves manufactured by Bell & Gossett or Red-White Valve with memory stop, positive shutoff, extended insulated handle and P/T type ports for balancing. Bell & Gossett circuit setter plus size 1/2" to 2", flow .25 GPM to 20 GPM.

F. Ball Valves - 2" and smaller may be used in lieu of gate valves. These valves shall be sweated bronze full port, with chrome plated ball, have extended insulated handles (such as NIBCO's Nib-seal or APOLLO VALVE’s Therma-seal) and rated at not less than 200-pound wog.

2.3 PRESSURE REDUCING VALVES

Pressure reducing valves shall be as shown on drawings and shall be manufactured by MUELLER, WATTS, or A.W. CASH.
2.4 STOP VALVES

Stop valves shall be bronze and shall be manufactured by NIBCO, BRASS CRAFT, McGUIRE, APOLLO, T & S BRASS or as identified in Section 15450 or 15451. Stop valves shall be loose-key type under all wall hung fixtures and shall be 1/4 turn ball valves with chrome plated ball, under all countertop fixtures. Compression fittings are not acceptable.

2.5 TRAP PRIMER VALVES

Trap primer valves shall be as shown on drawings and shall be manufactured by MIFAB, JAY R. SMITH, JOSAM, or ZURN. The prototype for trap primer valves is MIFAB model MR-500 (discharging ½ ounce of water each time a line pressure drop of 3 PSI is registered), with MIFAB model MI-DU distribution unit when multiple traps are supplied with a single primer valve.

PART 3 - EXECUTION

3.1 PIPING SUPPORTS

Piping supports in general shall be as called for in section 15050. The water piping in the plumbing chases shall be supported from the waste and vent pipes. The manufactured support system shall hold pipes secure to prevent vibration, to assure outlets are in proper position for fixture setting, and provide electrolytic isolation. Support of pipe, tubing and equipment shall be accomplished by means of engineered products, specific to each application. Makeshift, field devised methods shall not be allowed. The supports shall be manufactured by HOLDRITE, M-CO., ADJUSTO-SYSTEM, SUMMER SYSTEM, BRACKET SYSTEM, or CARPENTER & PATERSON.

3.2 SHOCK ABSORBERS

Shock absorbers shall be installed on the branch pipe supply to all quick opening and closing fixtures (including flush valves). Shock absorbers shall be sized in accordance with Plumbing and Drainage Institute Standard PDI-WH201 and shall be located as recommended by that standard so as to protect all flush valves on a branch pipe. Provide an isolation valve on the supply to all shock absorbers. Provide access panels for all shock absorbers located in concealed locations. Shock absorbers shall be constructed of a stainless steel shell with an elastomer bellows, stainless steel adaptor and male threaded plug. Shock absorbers shall be manufactured by JOSAM, JAY R. SMITH, or ZURN.

3.3 CLEANING/DISINFECTION OF PIPING SYSTEM

The entire piping system shall be flushed, disinfected, and restored to operation in accordance with the provisions of the International Plumbing Code and the Health Department requirements. All new, repaired or extensions of existing piping systems shall be flushed and disinfected prior to utilization. Provide Owner with a copy of the disinfection report. The report shall include as a minimum, chlorine solution concentration/duration method used, system pH level data including levels prior to commencement of work, levels during pre-flushing and levels during post flushing. System cleaning shall be witnessed by the Owner.
3.4 VALVES

A. Gate Valves/Ball Valves - Shall be installed at the service entrances, at the base of all risers and in the distribution system to isolate a group of three or more fixtures as well as at each shock absorber location.

B. Stop Valves - Shall be installed at each fixture.

C. Pressure Reducing Valves - Shall be installed at the service entrance when the water pressure exceeds 60 psi. Renewal projects shall have existing pressure reducing valves replaced. All valves shall have pressure gauges.

D. Check Valves - Shall be installed in water supply lines to all Mop Basins, Laundry Trays and kitchen 3 compartment sinks.

3.5 PIPE INSULATION

Pipe insulation shall be as called for in section 15250.

3.6 WATER SERVICE PIPING

Water service piping shall be installed below the recorded frost line but not less than three feet below the finished grade.

3.7 MECHANICALLY FORMED OUTLETS

Mechanically formed outlets shall have a collar height not less than three times the thickness of the branch tube wall. The branch shall be notched to conform to the inner curve of the run and shall be dimpled or otherwise impeded from penetrating the run pipe/tube. The branch tube shall also be dimpled to indicate the location of the notches with respect to the run. Such marking shall be at a sufficient distance from the face of the joint to allow for a visual point of inspection after the joint is brazed. All joints constructed using this method shall be brazed. Note: soft soldered joints will not be permitted.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL

The Bidding and Contract Requirements, Division 1 - General Requirements, Section 22 01 10 - General Provisions, and Section 22 01 30 - Basic Materials and Methods, shall apply to this section.

1.2 SCOPE

The work covered under this section shall include a complete soil, waste and vent system.

1.3 QUALITY ASSURANCE

The entire system shall be tested and approved as required by the plumbing code and local requirements before the system is covered up.

1.4 SUBMITTALS

Provide shop drawings on all piping and fittings as described in Section 22 01 10 - 1.04.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Materials

1. Cast Iron Soil Pipe and Fittings - Hubless Cast Iron pipe and fittings shall conform to CISPI 301 and ASTM A 888 and be marked with the collective trademark of the Cast Iron Soil Pipe Institute and listed by NSF International. Hubless Couplings shall conform to CISPI Standard 310 and be certified by NSF International. Heavy Duty couplings shall conform to ASTM C 1540 and shall be used if indicated. Gaskets shall conform to ASTM C 564. All pipe and fittings to be produced by a single manufacturer and are to be installed in accordance with manufacturer’s recommendations and applicable code requirements. Couplings shall be installed in accordance with the manufacturer’s band tightening sequence and torque recommendations. Tighten bands with a properly calibrated torque limiting device. Hub and Spigot Cast Iron pipe and fittings shall be manufactured from gray cast iron and shall conform to ASTM A 74. All pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute and listed by NSF International. Manufacturers shall be one of the following:

   a. AB&I Foundry

   b. Charlotte Pipe and Foundry
c. Tyler Pipe

2. PVC Schedule 40 Pipe and Fittings - shall be manufactured from PVC compound with a cell class of 11432 per ASTM D 4396 for pipe and 12454 per ASTM D 1784 for fittings and conform with National Sanitation Foundation (NSF) Standard 14. Pipe shall be iron pipe size (IPS) conforming to ASTM D2665. Injection molded fittings shall conform to ASTM D 2665. Fabricated fittings shall conform to ASTM F 1866. All pipe and fittings to be produced by a single manufacturer and to be installed in accordance with manufacturer’s recommendations and local code requirements.

B. Pipe Schedule

1. Soil and Waste Pipe and Fittings Below Grade - Shall be service weight cast iron bell-and-spigot pipe and fittings or PVC schedule 40 plastic pipe and PVC-DWV fittings.

2. Soil, Waste, and Vent Pipe and Fittings Above Grade - Shall be service weight cast iron bell-and-spigot pipe and fittings, schedule 40 galvanized steel pipe with screwed cast iron drainage pattern fittings, cast iron no-hub piping and fitting or PVC schedule 40 plastic pipe and PVC-DWV fittings except as noted in paragraph '3'. PVC plastic piping shall not be used in plenum spaces. DWV copper tubing and copper drainage pattern fittings shall be used for piping at the 3-compartment sink. All piping between the science prep room sinks and the acid neutralization basin shall be acid resistant polypropylene pipe and fittings.

3. Soil, Waste, and Vent Stacks - Shall be cast iron bell and spigot pipe and fittings or cast iron no-hub pipe.

2.2 VENT FLASHINGS

Vent flashings shall be 3 lb. per square foot lead flashings or 2½ lb. per square foot for prefabricated flashings, except on roofs where the manufacturer of the roof requires a special flashing to tie in his roofing system.

PART 3 - EXECUTION

3.1 PIPE AND FITTINGS

A. All soil and waste piping shall be run at a minimum grade of 1/4" per foot unless otherwise noted on the drawings. The Contractor shall field check all proposed soil and waste piping to verify that the piping system can be installed at the required grade before any soil and waste piping is installed.

B. When the Building Sewer piping is installed using non-metallic piping, an insulated tracer wire, 18 AWG minimum in size and suitable for direct burial shall be installed in the same trench as the sewer within 12 inches of the pipe, this tracer wire shall terminate at the cleanout access cover.
C. Buried PVC schedule 40 pipe shall be installed in accordance with ASTM D 2321. Solvent cement joints shall be made in a two-step process with primer manufactured for thermoplastic piping systems and solvent cement conforming to ASTM F 656 and ASTM D 2564.

D. Solvent cement PVC joints shall be protected from chemical agents, fire-stopping materials, thread sealant, plasticized-vinyl products or other aggressive chemical agents not compatible with PVC compounds. The system shall be hydrostatically tested after installation.

E. All openings in the piping system during construction shall be securely capped to prevent foreign matter from entering the piping system.

F. Piping to cleanouts shall be as shown on the drawings and as required by the local plumbing code.

G. The minimum depth of the building sewer shall be no less than two feet below finished grade.

H. Double sanitary tee fittings shall not be allowed for piping receiving the discharge from fixtures or appliances.

I. PVC flanges shall not be allowed for water closets or urinals.

J. Copper pipe and fittings shall not be used on waste piping for urinals.

3.2 VENTS AND VENT FLASHINGS

A. Vent pipes shall extend 12" above the roof unless otherwise required. The minimum size vent through roof shall be 2".

B. The lead vent flashings shall be turned down on the inside of the vent. On roofing systems where the roofing manufacturer requires a special flashing, the contractor shall install flashing as required.

C. Vent piping shall not terminate within ten feet of outside air intakes.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL

The Bidding and Contract requirements, Division 1 - General Requirements, Section 22 01 10 - General Provisions, and Section 22 0130 - Basic Materials and Methods shall apply to this section.

1.2 SCOPE

The work covered under this section shall include furnishing and installing the plumbing equipment and making the final connections of equipment furnished by others.

1.3 SUBMITTALS

Provide shop drawings on all equipment as described in Section 22 01 10 - 1.04. Shop drawings shall include uses of all items.

PART 2 - PRODUCTS

2.1 The following equipment shall be as manufactured by JAY R. SMITH. Equipment fully equal to the item specified manufactured by CONBRACO INDUSTRIES, INC., APOLLO VALVE, JOSAM MANUFACTURING, WADE, WATTS, MIFAB or ZURN shall be acceptable.

A. Cleanouts (CO) - Shall be JAY R. SMITH 4031L inside, provide carpet marker(-Y) when necessary, 4293L outside, stack cleanout 4510 tapped bronze plug to accept screw for 4710 round stainless steel access cover and 4111L-U for cleanouts located in sidewalks with 4915-CO frame and access cover. Cleanouts at the Building Drain/Building Sewer junction shall have a 18"x18"x6" concrete pad with 4915-CO frame and access cover.

B. Wall Hydrants (WH) - Shall be JAY R. SMITH 5519-WC Series automatic draining, non-freeze wall hydrant with vacuum breaker and wall box with chrome finish; provide wall clamp.

C. Hose Bibb (HB) - Shall be WOODFORD model 24 wall faucet with vacuum breaker. Hose bibbs in occupied rooms shall be chrome plated with a loose tee key. Hose bibbs in mechanical rooms and unoccupied spaces shall be brass finish with wheel handle.

D. Floor Drains (FD) toilet rooms and kitchen - Shall be JAY R. SMITH 2005-A5NB-U-B vandal proof, sediment bucket, round bronze top and adjustable strainer. Provide SureSeal model SS3009V inline floor drain trap seal barrier.
E. Floor Drains (FD-1) mechanical rooms and sprinkler rooms - Shall be JAY R. SMITH 2220L-PB-P050 with sediment bucket and round bronze top. Provide SureSeal model SS3009V inline floor drain trap seal barrier.

F. Shock Absorbers - Shall be JAY R. SMITH 5000 series.

G. Check valve (condensate drains) - Shall be WATTS CV series, bronze, straight pattern swing check.

2.2 BACKFLOW PREVENTERS

Refrigerators with ice makers or ice machines - CONBRACO INDUSTRIES, INC., APOLLO VALVE model DUCLF4N series. Backflow preventers fully equal to the items specified as manufactured by WATTS shall be acceptable.

2.3 TEMPERING VALVES

Tempering Valves - LEONARD VALVE model 270-LF, ASSE 1070 approved, with check valves. Tempering valves fully equal to the item specified as manufactured by CONBRACO, APOLLO, POWERS, HONEYWELL, LAWLER or SYMMONS shall be acceptable.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Floor drains shall be installed complete including a trap primer/trap barrier if required by local authority having jurisdiction. Floor drains shall be flashed with a 3-foot diameter sheet of 4 pound lead when installed above ground. The size of the floor drains shall be as shown on the drawings.

B. Cleanouts shall be installed in an accessible location. Install carpet markers, cleanout access covers or access panels where required for accessibility. The size of the cleanouts shall be as shown on the drawings. Cleanout plugs shall be installed with a non-hardening type pipe dope on threads to allow for easy removal of plugs.

C. Wall hydrants shall be installed with backflow preventer and a stop and waste valve in an accessible location. The hydrants shall be selected to match the wall thickness at the location to be installed. Provide Owner with separate 'T' handle key for each wall hydrant.

D. Shock absorbers shall be installed as listed in section 15401 and as required by local authority, in an accessible location.

E. Interceptors shall be installed complete. The interceptor shall be installed as recommended by the manufacturer and local codes. Flow control devices shall be installed in the drain line from the 3-compartment sink.

F. Tempering valves shall be installed as recommended by the manufacturer. After installation is complete, the contractor shall have the manufacturer’s authorized representative verify that the installation complies with the manufacturer's requirements.
The representative shall take apart and clean valve, set-up and adjust the valve for proper operation at the end of project, but before final inspection. Provide the Owner with a copy of the inspection and set-up report.

G. When the Building Sewer piping is installed using non-metallic piping, an insulated tracer wire, 18 AWG minimum in size and suitable for direct burial shall be installed in the same trench as the sewer within 12 inches of the pipe, this tracer wire shall terminate at the cleanout access cover.

3.2 BACKFLOW PREVENTERS

Backflow preventers shall be installed as shown on the drawings or as required by the local codes and shall be mounted no higher than 66 inches above finished floor.

END OF SECTION
SECTION 22 42 13

PLUMBING FIXTURES AND TRIM

PART 1 - GENERAL

1.1 GENERAL

The Bidding and Contract requirements, Division 1 - General Requirements, Section 22 01 10 - General Provisions and Section 22 01 30 - Basic Materials and Methods, shall apply to this section.

1.2 SCOPE

The work covered under this section shall include furnishing and installing the plumbing fixtures and trim and making all final connections of equipment furnished by others.

1.3 SUBMITTALS

Provide shop drawings on these fixtures and trim items as described in Section 22 01 10 - 1.04. Shop drawings shall include proposed uses of all fixtures and trim.

PART 2 - PRODUCTS

2.1 WATER CLOSETS

KOHLER COMPANY shall manufacture the following plumbing fixtures. Vitreous china plumbing fixtures fully equal to the item specified manufactured by AMERICAN STANDARD shall be acceptable. Flush valves fully equal to the item specified and manufactured by SLOAN, or ZURN shall be acceptable. Toilet seats fully equal to the item specified and manufactured by KOHLER, BEMIS or CHURCH shall be acceptable.

A. Water Closet (WC) - KOHLER Wellcomme Lite Toilet, elongated K-4350, 14 3/4" high (white); K-4670SC solid plastic, white, open front, self-sustaining check hinge, and elongated; flush valve - SLOAN Regal XL 111-1.6, 1.6 gpf, flush valve handles shall be located on the wide side of stalls for handicapped fixtures, 1" screwdriver stop and vandal proof cap, Bolt caps - 52048.

B. Water Closet (WC-2) - Adult Handicapped - KOHLER Highcliff Lite Toilet, Water Guard elongated K-4368, 17½" high; K-4670SC solid plastic, white, open front, self-sustaining check hinge and elongated. Flush valve - SLOAN Regal WES 111, Uppercut 1.6/1.0 gpf dual flush valve. Flush valves shall be located on the wide side of stalls; Bolt caps - 52048.
2.2 LAVATORIES

KOHLER COMPANY shall manufacture the following plumbing fixtures. Vitreous china plumbing fixtures fully equal to the item specified, manufactured by AMERICAN STANDARD shall be acceptable. Faucets fully equal to the item specified and manufactured by CHICAGO FAUCETS or SLOAN shall be acceptable. Trim items manufactured by KOHLER, AMERICAN STANDARD, NIBCO, ELKAY, McGUIRE BRASSCRAFT, T&ES BRASS, MOEN or CHICAGO FAUCETS shall be acceptable. All trim items shall have heavy duty or extra duty components. All faucets shall be Certified Lead Free in accordance with NSF 372.

A. Lavatory (L-1) Child Handicapped - KOHLER K-1728, white, vitreous china, 20" X 18" Chesapeake with single hole faucet drilling, supply faucet - KOHLER K-400T20-5ANL-CP centerset lavatory faucet with; K-7715 drain with perforated strainer, 1 1/4" tailpiece; P-Trap - K-8995 1 1/4" X 1 1/2" chromium plated cast brass with cleanout plug; Nipple - K-9016 1 1/2" x 6" chromium plated cast brass with escutcheon; Supplies - K-7605 with loose key stops, chromium plated with escutcheons; Carrier - JOSAM 17100-67. Provide TRUEBRO Model 102 white trap and supply covers. Covers as manufactured by PLUMBEREX (Pro Series) shall be acceptable.

B. Lavatory (L-2) Adult Handicapped - KOHLER K-1728, white, vitreous china, 20" X 18" Chesapeake with single hole faucet drilling, supply faucet - KOHLER K-400T20-5ANL-CP 4" centerset lavatory faucet with; K-7715 drain with perforated strainer, 1 1/4" tailpiece; P-Trap - K-8995 1 1/4" X 1 1/2" chromium plated cast brass with cleanout plug; Nipple - K-9016 1 1/2" x 6" chromium plated cast brass with escutcheon; Supplies - K-7605 with loose key stops, chromium plated with escutcheons; Carrier - JOSAM 17100-67. Provide TRUEBRO Model 102 white trap and supply covers. Covers as manufactured by PLUMBEREX (Pro Series) shall be acceptable.

2.3 ELECTRIC WATER COOLERS AND DRINKING FOUNTAINS

The following electric water coolers (and/or drinking fountains) shall be manufactured by ELKAY – no substitutions.

A. Electric Water Cooler (EWC-1) - Adult Handicapped - ELKAY wall mounted bi-level water cooler model No. LZSTL8WSLK, complete with flexi-guard bubblers, bottle filling station and water filter.

2.4 OTHER FURNISHED EQUIPMENT

A. The Contractor shall make a complete waste, vent, hot and cold water rough in for all fixtures, equipment and food service equipment as indicated on the drawings. Furnish and install threaded 1/4 turn shut off valves for all countertop fixtures and KOHLER K-7605 supplies for all wall hung fixtures; traps, tailpieces, sink strainers, supply pipes, air gaps, escutcheons, and make all final connections for a complete installation. All sinks that are shown to be handicap accessible (see Architectural drawings) shall have offset tailpieces.

B. The Contractor shall consult the architectural drawings and other sections of the specifications for equipment requiring roughing in and final connection under this section of the contract.
3.1 INSTALLATION

A. The water supply to each surface mounted fixture shall have angle, loose key stop valves. On fixtures without integral stops, install stop valves. Fixtures which are installed in casework, or fixtures with plumbing components which are not visible from the occupied space shall have 1/4 turn, sweated ball valves with chrome plated ball and escutcheons. The water supply piping for fixtures located in casework shall be type ‘L’ copper from the valve to the fixture, with the piping run in such a manner as to allow the space below the fixture to be utilized for storage.

B. Wall hung fixtures such as urinals, lavatories, sinks, electric water coolers, and drinking fountains, shall have carriers. The specified carriers may not be compatible for all fixture manufacturers. Carriers shall be coordinated between the fixture manufacturer and the carrier manufacturer. Where the carrier is not specified with the fixture, the fixture carrier shall be a 1/8 inch steel plate embedded or anchored in the wall with all-thread rods bolted or welded to the plate and extending through the finished wall for the fixture hanger installation. The minimum size rod shall be 1/4". The fixture carrier shall be installed while the wall is being built.

C. The plumbing fixtures shall be installed at the mounting heights required by Alexandria City Public Schools standards. Where mounting heights are not stated, the plumbing fixtures shall be roughed-in in accordance with the manufacturer's rough-in information.

D. The Contractor shall provide a complete rough in and make all final connections to the equipment furnished by others.

E. The Contractor shall provide watertight seals at all joints formed where fixtures come in contact with walls or floors.

F. All exposed piping components for lavatory faucets shall be chrome plated or stainless steel if such components appear below the apron of the fixture. Faucets with exposed brass pigtails will not be acceptable.

G. All sinks and lavatories that are indicated to be handicapped accessible shall have offset tailpieces.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL

The Bidding and Contract Requirements, Division 1 - General requirements and section 23 05 01 - General Provisions, shall apply to this section.

1.2 SCOPE

The work covered under this section covers the basic materials and methods for a complete mechanical system.

PART 2 - PRODUCTS

2.1 PIPE AND PIPE FITTINGS

A. All materials shall be of an approved type and shall be designed for the pressures and temperatures at which they are to be operated, for the materials they are to handle and for their intended use.

B. Materials shall conform to the standard reference numbers listed below. See individual sections of the specifications for use.

1. Ductile Iron Water Pipe - (Water Service) - AWWA C151.
2. Copper Tubing (Water Distribution - Type L or K) - ASTM B75, B88, B251
5. Cast Iron Soil Pipe - ASTM A74, A888; CISPI 301
6. Copper Pipe (Waste, Vent, & Hydronic) - ASTM B42, B302
7. Galvanized Steel Pipe (Waste & Vent) - ASTM A53
10. Concrete Pipe - ASTM C14, C76
11. Steel Pipe - ASTM A53, A106
13. Steel Butt Welding Fittings - ASME B16.9
14. Steel Fittings - ASTM A420
15. Gray Cast Iron Fittings - ASTM A126
16. Steel Pipe Flanges - ASME B16.5

2.2 PIPING SPECIALTIES

Piping Specialties shall be designed and installed to meet the intended use including pressures and temperature.

A. Gaskets - Shall be full face with a working pressure of 300 lbs. and temperature up to 212°F. Gaskets shall be manufactured by JM CLIPPER, US PIPE, FNW, or AMERICAN.

B. Strainers - HONEYWELL-BRAUKMAN, ARMSTRONG or SARCO.

C. Unions
   1. Unions shall be of an approved type, shall meet the requirements for the pressure and temperature at which they are to operate and shall be compatible with the pipe materials.
   2. Brass Couplings - Shall be used for connecting steel pipe to copper tubing.
   3. Die-electric unions or waterways shall not be permitted.

D. Escutcheons - Escutcheon plates shall be stamped brass chromium plated, shall be of sufficient size to cover sleeved openings for the pipes, shall be of sufficient depth to cover sleeves projecting above floors, and shall be manufactured by BLATON AND CALDWELL, DEARBORN BRASS, MASON or GRINNELL.

E. Gauges and Thermometers - Shall be as listed below unless otherwise specified under other sections of the specifications.
   1. Temperature Gauges or Thermometers - Shall be the separable socket, adjustable angle type, not less than 9" scale V-shaped, organic filled, blue reading column. Range shall be applicable for the service. Thermometers shall be adjustable type to permit easy reading from floor and outside of insulation, as manufactured by ASHCROFT, WEKSLER, TAYLOR or TRERICE.
   2. Pressure Gauges - Shall be of the liquid filled, bourdon-tube type with dial diameter not less than 4" and operating range 0 - 160 psig. Install a shut-off cock in line to each gauge. Gauges as manufactured by ASHCROFT, WEKSLER,
3. Compound Gauges - Shall be of the liquid filled, bourdon-tube type with dial diameter not less than 4" and operating range 30" - 0 - 30 psig. Install a shut-off cock in line to each gauge. Gauges as manufactured by ASHCROFT, WEKSLER, TAYLOR or TRERICE.

2.3 PIPE HANGERS AND SUPPORTS

A. Pipe Hangers and Supports Material - Provide a combination of pipe hangers and supports such as steel and copper clad clevis hangers, round steel rods, concrete inserts, clamps, brackets and other items as applicable. Hangers and supports shall meet the recommendations of the manufacturer. Parallel runs of horizontal piping shall be grouped together on adjustable trapeze hangers. All hangers in contact with copper pipe shall be copper-plated. Pipe hangers and support shall be of the size to accommodate the pipe and insulation where applicable. Pipe hangers and supports manufacturer: MASON, GRINNELL, CARPENTER AND PATerson, ANVIL or NIBCO.

1. VRF Pipe hangers and supports.
   a. Multiple runs of VRF piping shall be grouped together on preformed U channel, (trapeze) hanger spacing and hanger rods as described below.
   b. VRF piping shall be mounted to be preformed U channel with two piece pipe straps (clamps) with cushioned insert.
   c. The two piece pipe straps (clamps) shall be sized to snugly fit the outside diameter of the pipe insulation.
   d. Hangers shall be installed on each side of pipe direction changes and within 2 feet of each direction change.

B. Hanger Spacing for Horizontal Pipe shall not exceed:

1. Cast Iron Soil Pipe (all diameters) 5'-0"
2. Plastic Pipe (all diameters) 4'-0"
3. Schedule 40 Steel Pipe
   - ½” to 1” Pipe 6'-0"
   - 1-1/4” to 2” Pipe 8'-0"
   - 2-1/2” to 4” Pipe 10'-0”
   - 5” and Larger Pipe 12'-0”
4. Type ‘L’ Copper Tubing
   - ½” to ¾” Pipe 5'-0"
   - 1” Pipe 6'-0"
   - 1-1/4” Pipe 7'-0"
C. Hanger Spacing for Vertical Pipe shall not exceed:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1/2&quot; to 2&quot;</td>
<td>8'-0&quot;</td>
</tr>
<tr>
<td>2-1/2&quot;</td>
<td>9'-0&quot;</td>
</tr>
<tr>
<td>3&quot;</td>
<td>10'-0&quot;</td>
</tr>
<tr>
<td>3-1/2&quot;</td>
<td>11'-0&quot;</td>
</tr>
<tr>
<td>4&quot;</td>
<td>12'-0&quot;</td>
</tr>
<tr>
<td>5&quot;</td>
<td>13'-0&quot;</td>
</tr>
<tr>
<td>6&quot;</td>
<td>14'-0&quot;</td>
</tr>
</tbody>
</table>

D. Hanger Rods shall be at least:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot;</td>
<td>3/8&quot; diameter</td>
</tr>
<tr>
<td>2 1/2&quot; to 3&quot;</td>
<td>1/2&quot; diameter</td>
</tr>
<tr>
<td>4&quot; to 5&quot;</td>
<td>5/8&quot; diameter</td>
</tr>
<tr>
<td>6&quot; to 8&quot;</td>
<td>3/4&quot; diameter</td>
</tr>
<tr>
<td>10&quot; to 12&quot;</td>
<td>7/8&quot; diameter</td>
</tr>
</tbody>
</table>

E. Sheet Metal Saddles - Supports for insulated pipes shall not contact the pipe but shall surround the unbroken covering. Provide galvanized steel sheet metal saddles properly formed to the jacket between hanger and the lower 1/3 of the circumference. The size of the saddles shall be as follows:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>3&quot; to 4&quot;</td>
<td>24 gauge x 12” long</td>
</tr>
<tr>
<td>4&quot; to 6&quot;</td>
<td>18 gauge x 12” long</td>
</tr>
<tr>
<td>8&quot; and larger</td>
<td>16 gauge x 12” long</td>
</tr>
</tbody>
</table>

2.4 VALVES

A. Valves shall be of an approved type and shall meet the requirements for the pressure and temperature at which they are to be operated, for the material they are to handle and for their intended use. Valve manufacturers are listed in the individual sections of the specifications.

B. Valve and Tag Chart - Furnish and install on each valve a brass tag with a number and the abbreviation PLMB (for plumbing) HVAC (for mechanical systems) embossed in the brass tag for each valve and securely fastened to each valve wheel with beaded chain or brass wire. Provide a laminated chart in the water heater room, showing the locations and use of each valve. Laminating film shall be at least 10mil thick. Two charts shall be provided - one for the plumbing valves and one for the heating and cooling valves. The plumbing valves shall start with number 1 and continue consecutively until all plumbing valves are numbered. The heating and cooling valves shall start with number 1 and continue consecutively until all heating and cooling valves are numbered. A copy of the valve tag charts shall also be contained in the operation and maintenance manual.
2.5 ACCESS DOORS

A. The contractor shall furnish access panels not smaller than 16 X 16" for access to concealed valves, traps, dampers, etc. where no other means of access is provided. Access panels shall be all steel construction with no. 16 gauge wall or ceiling and no. 14 gauge panel door with not less than 1/8" insulation secured to inside of the door. Doors shall be supported with concealed hinges and secured with suitable clips and countersunk flush screws. Outside of access panels shall be flush with finished wall or ceilings, except that where panels are located in acoustic tile or paneling, the door shall be recessed to receive adjacent finish material. The contractor shall determine the final position of each access door and the size to be used. Access panels shall be as manufactured by MILCOR. Fire ratings of access door shall not be less than the surface on which the door is installed. Where required by specifications locking access doors shall be fitted with a HL302 lock cylinder and key.

2.6 ELECTRIC MOTORS

A. The contractor shall provide and install all electric motors for equipment furnished under Division 23. All motors shall be NEMA standard design for quiet operation. The motors shall be of ample size to operate at their proper load and full speed continuously without causing noise, vibration or temperature rise in excess of the rating. Provide high efficiency motors when called for on the drawings or hereinafterspecified.

B. Motors with belted drives shall be mounted in a manner to allow for belt adjustment. All belts shall be adjusted before turning project over to owner. All motors with belt drives shall have belt guards.

2.7 ELECTRIC MOTOR STARTERS

The contractor shall furnish all motor starters complete with lugs sized to receive conductors specified and with accessories as required such as stop-start push button switches, hand-off-auto selector switches, pilot lights, remote switches, auxiliary contacts, transformers, relays, fuses and overload thermal units or heaters. Contractor coil voltage shall be 24 volts. All components are to be housed within enclosure.

A. The motor starters shall be the type to meet the requirements of the motor and shall be in accordance with NEMA Standards, sizes and horsepower ratings. The starters shall be manufactured by SQUARE 'D', GENERAL ELECTRIC, CUTLER-HAMMER or SIEMENS.

B. Three phase motors shall have across-the-line magnetic starter and single-phase motors shall have manual starters. The starters shall have NEMA 1 enclosures unless otherwise noted or required. Outdoor starters shall have weatherproof enclosures.

C. The starter shall have an overload thermal unit in each phase conductor. The thermal units shall be sized as recommended by the manufacturer for full protection of the motor.

D. All three phase motors and equipment with compressors shall be provided with three phase motor protectors as manufactured by DIVERSIFED, SLM-ASE series (match...
voltage to corresponding model number). Unit shall include range plug, output fuse, output switch, line adjustment, status/trouble lights and adjustable/selectable operation with built-in time delays. Unit shall be U/L labeled. Protectors as manufactured by TIMEMARK #265 or MOTECTOR Power Guardian PLUS shall also be acceptable.

2.8 EQUIPMENT

A. Equipment shall be furnished and installed as listed in the specifications or as required for a complete project.

B. All equipment shall be new and shall bear the manufacturer's name and trade name. The equipment furnished under each section of the specifications shall be essentially the standard product of a manufacturer regularly engaged in the production of the required type of equipment.

C. All three phase equipment and equipment with compressors shall be provided with three phase motor protectors as manufactured by DIVERSIFIED, SLM-ASE series (match voltage to corresponding model number). Unit shall include range plug, output switch, line adjustment, status/trouble lights and adjustable/selectable operation with built-in time delays. Unit shall be U/L labeled. Protectors as manufactured by TIMEMARK #265 or MOTECTOR Power Guardian PLUS shall also be acceptable.

D. Nameplates/Labels – Provide engraved pin-attached laminated plastic nameplates for all pumps, air handling units, exhaust fans, boilers, chillers, fan powered heaters unit ventilators, fan coil units, blower coil units, terminal devices, VAV boxes, fire dampers, smoke detectors and roof mounted equipment. Where equipment is located above the ceiling, nameplates shall be mounted on the ceiling below the device. Exhaust fans located on the roof will require two separate nameplates; one is to be attached to the fan, the other on the ceiling grid directly below the fan. Each nameplate shall identify the item served, such as “PRV-2.” or “SMOKE DETECTOR AHU-1” Laminated plastic shall be one eight (1/8) thick, black with white center core, exception: fire damper nameplates shall be red with white center core. Nameplates shall be a minimum of one inch by three inches, with minimum one-quarter inch high block lettering. Adhesive backed, embossed lettering tape is not acceptable. Exhaust grilles or registers in each space shall be labeled. Each label shall identify the exhaust fan serving this grille or register, such as “PRV-2”. Identification labels shall be BROTHER type “P-TOUCH”, clear tape with upper case letters, minimum ¼ inch high block lettering, and black printing and shall be located on the ceiling grid next to the grille or register.

PART 3 - EXECUTION

3.1 PIPE, FITTINGS AND JOINTS

A. Pipe and Fittings

1. Pipe, fittings and specialties stored at the job shall be stored in such a manner as to prevent dirt and moisture from collecting in the material. Openings in the piping system during construction shall be protected at all times from foreign matter entering the piping system. PVC piping shall not be stored in direct sunlight.
2. **Installation** - The piping shall be installed complete and shall be of the size required by code. When a size is not indicated or is in conflict with other drawings, the contractor shall request the pipe size from the engineer. All piping shall be cut accurately from dimensions established at the project site and allowances shall be made for the clearance of windows, doors and other openings. No part of the building structure may be cut to allow for the installation of piping unless specifically approved in writing.

3. All piping shall be installed parallel or perpendicular to the building construction and shall be installed so as to allow for expansion and drainage. Due to the small scale of the drawings, it is not possible to show all elbows and swing joints required to allow for expansion; however, the contractor shall install three elbow swing joints at all runouts and other connection to mains.

4. Install continuous galvanized sheet metal drip pan under all water piping passing through all rooms with electrical equipment such as electrical, elevator equipment and transformer rooms and all other spaces provided primarily for the installation of electrical equipment. Drip pan shall be channeled out of the space and be extended to the closest drain.

5. Eccentric reducing fittings or eccentric reducing couplings shall be installed to bring top of mains in line and prevent pockets. Eccentric fittings will not be required on water mains. Ends of pipes shall be reamed out before being installed.

6. **Pipe Sleeves**

   a. Pipe sleeves shall be installed on all pipes passing through walls, ceilings and floors except floor slabs on grade. On insulated pipes the sleeves shall be large enough to pass the insulation without damaging the vapor barrier. The ends of the sleeves shall extend 1/2" above the finished floor and made watertight around sleeve. Where pipes pass through fire rated floors and wall the space between the pipe and the sleeve shall be fire stopped and smoke stopped with the appropriate U.L. rated assembly. Sleeves not in contact with the earth shall be schedule 40 black steel pipes, except sleeves in poured concrete slabs above grade may be a manufactured pipe sleeve. PVC sleeves shall not be used in plenum spaces.

   b. Pipe Sleeves in contact with the earth shall be cast iron. The space between the pipe and the cast iron pipe sleeve shall be packed with oakum with a lead joint and made watertight. The pipe passing through and under footings and wall below grade shall have cast iron sleeves. The sleeves not entering the building need not be watertight.

B. **Piping Joints**

1. **Screwed Joints** - Screwed joints shall be made with full cut American Standard...
Pipe Thread. All pipes shall be reamed to full diameter of the pipe. Pipe thread compound shall be applied to the male thread only.

2. Welded Joints

a. Welded joints for steel pipe 2 1/2" and larger shall be made in accordance with the procedure standard in the American Standards Association piping code, and before assigning any welder to work covered, the contractor shall provide for the approval of the name(s) of pipe welders to be employed in the work, together with certification that each of these welders has passed qualification tests as prescribed by the National Certified Pipe Welding Bureau or by other reputable testing laboratory or agency using procedures approved by the ASME or American Welding Society. The contractor shall use only approved factory manufactured welding type fitting for the intersection welding or branching to mains. Valves and specialties shall have screwed or flanged joints.

b. Welding tees, ells, reducers and caps shall be of wrought or forged construction similar to those manufactured by TUBE TURNS, INC. In lieu of wrought or forged welding tees for branch outlets, weldolets or welding nipples may be used; provided, first that the nipples are accurately coped in the shop to fit the pipes and leveled for field welding; and provided, second that openings in the walls of pipes are cut to full inside diameter of the nipples; and third, that the outlet diameter shall be less than 3/4 the diameter of the main.

c. For connections on welded piping to valves 2 1/2" and over and that of other accessories required to be flanged, weld neck or slip-on companion flanges shall be used. The flange face shall be in every case perpendicular to the axis of the pipe valve.

3. Solder Joints - the solder joint above grade shall be made, unless otherwise noted, with 95/5, lead free solder using approved flux. All underground joints and refrigeration joints shall be made with an approved silver bearing solder. Cut pipe shall be reamed to full diameter. Copper to steel pipe shall be made with proper fittings.

4. Cast Iron Pipe Joints - for bell-and-spigot soil pipe the joint shall be firmly packed with oakum and filled with molten lead not less than 1" deep and not to extend more than one-eighth inch below the rim. The use of a neoprene gasket when installed in accordance with the manufacturer's recommendations is also acceptable.

5. Concrete Pipe Joint - Shall be bituminous joint compound or a cement plaster installed in accordance with the manufacturer's recommendations. Joints firmly packed with oakum and filled with a concrete mortar, which shall extend mortar to 3” beyond the hub, shall also be acceptable. All joints shall be made with precast concrete fittings.
6. Flanged joint - The flanged joint shall be made with the proper number and size of bolts and with the proper gasket between the flanges.

7. Plastic Pipe Joints - Shall be made with solvent as recommended by the pipe manufacturer.

3.2 PIPE SPECIALTIES

A. Pipe specialties shall be installed as indicated in the specifications and as required to make a complete system.

B. Escutcheon Plates shall be mounted on all exposed pipes extending through wall, floor, ceiling or cabinet bases. On insulated pipes the escutcheon shall be on the outside of the insulation.

C. Pressure and Compound Gauges shall be installed with shut-off cock in the line to each gauge.

3.3 PIPE HANGERS AND SUPPORTS

A. All pipes shall be supported from the building structure, and wherever possible, parallel runs of horizontal piping shall be grouped together on adjustable trapeze hangers. Single runs of horizontal piping shall be supported with clevis type hangers. The hangers shall be on the outside of the insulation. Vertical risers shall be supported at each floor line with steel pipe clamps. All hangers in contact with copper pipe shall be copper plated. The use of wire or perforated metal to support pipe will not be permitted. In no case shall copper pipe be in contact with a ferrous metal.

B. The pipe hanger spacing and support shall be as listed under 2.03 in this section.

C. Where piping is supported from the steel, the support shall be attached at the top of the steel. Attachments shall be made either by welding or using top beam clamps.

D. Any supplemental steel required between building structural members shall be provided by this contractor.

3.4 VALVES

A. The contractor shall install valves where indicated on the drawings and where required for adequate control of the system. Provide shut-off valves at the base of the risers and main branches at points of take-offs from the supply or return mains. Branches shall be considered main branches when they serve three or more units or fixtures. Provide valves necessary to isolate each piece of equipment separately from the remainder of the system. Valves shall be installed in accessible locations. Allow isolation for inspection, maintenance and repair of each piece of equipment and each service loop. Provide valves to allow for the phasing of work where required. Valve size shall be the same as the pipe size except for control valves.

B. Valves shall be installed with their stems in an upright or horizontal position. Stems shall not be inverted.
C. After approval of a particular valve, this type valve shall be used throughout the project. Do not mix styles or manufacturers.

D. Ball valves shall be provided with a 2” extended handle of a non-thermal conductive material and shall include a protective sleeve that allows operation of the valve without breaking the vapor seal or disturbing the insulation. Extended handle shall be internally insulated.

3.5 ACCESS DOORS

A. Install hinged and lock type access doors as required for operation and maintenance of equipment. The access doors shall be installed so that they maintain the rating integrity of the material in which they are mounted. Those with an exposed surface in a finished area shall be flush with the finished material with a recessed space for installation of flush matching materials when in panel or acoustical tile.

3.6 ELECTRIC MOTORS

A. Electric motors shall be supplied with equipment furnished under Division 23. All moving parts shall be protected as required by OSHA.

3.7 ELECTRIC MOTOR STARTERS

A. Electric motor starters and accessories shall be installed under Division 26.

B. Three phase motor protectors shall be installed in accordance with manufacturers’ recommendations and installation instructions. Unit shall be selected for voltage specified.

3.8 EQUIPMENT

A. The contractor shall receive and properly store the equipment pertaining to the mechanical work. The equipment shall be tightly covered and protected against dirt, water, chemical or mechanical injury and theft. The manufacturer's directions shall be followed completely in the delivery, storage, protection and installation of all equipment and materials.

B. The contractor shall provide and install all items necessary for the complete installation of the equipment as required by code without additional cost to the owner, regardless of whether the items are covered in the specifications. Such items could be - but are not limited to: concrete pad, supports, vibration eliminators, additional piping and valves, motor controllers, relief valves and piping, insulation, electrical wiring, lubrication, refrigerants and start-up and service.

C. It shall be the responsibility of the contractor to clean the equipment, make necessary adjustments and place the equipment into operation before turning equipment over to the Owner. Any paint that was scratched during construction shall be touched-up with factory color paint. Any items that were damaged during construction shall be replaced.
D. Where equipment is supported from the steel, the support shall be attached at the top of the steel. Attachments shall be made either by welding or using top beam clamps.

E. Three phase motor protectors shall be installed in accordance with manufacturer’s recommendations and installation instructions. Unit shall be selected for voltage specified. Motor protectors shall be installed prior to start-up.

F. Permission for the use of new HVAC equipment to be used as a method for providing temporary heating or cooling shall be at the discretion of the owner. The use of new HVAC equipment for temporary heating or cooling shall not modify the terms of the warranty nor shall it constitute substantial completion or beneficial use. The mechanical contractor is responsible for providing a dust free HVAC system and shall correct all equipment or system damage caused by construction operations. New HVAC equipment used for temporary heating or cooling shall have the filters changed on a regular basis or as directed by the owner and prior to turning over equipment for permanent operation. The spare filters provided by the specifications shall not be used for this purpose. The equipment fan belts shall be inspected for excessive wear and replaced as directed by the owner. The equipment cooling coils, condensing coils, heat exchangers, energy recovery devices and associated ductwork shall be inspected for cleanliness and cleaned as directed by the owner, to a level satisfactory to the owner which may include this work to be done by an independent third party contractor at this contractor’s expense.

G. The mechanical contractor shall set all outside air dampers to the approximate minimum position during equipment installation and prior to the start-up of equipment.

H. The installer shall be responsible for providing and installing new fan or motor sheaves and belts when required to obtain the designed airflow.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL

A. The Bidding and Contract Requirements and Division 01 - General Requirements for the Construction of this project shall apply to this division and all sections herein.

B. Where items under the Bidding and Contract Requirements, and Division 01 - General Requirements are repeated in this section, it is intended to call particular attention to or qualify the items. It is not intended that any other parts under the Bidding and Contract Requirements of Division 01 - General Requirements shall be assumed to be omitted if not repeated herein.

1.2 SCOPE

A. The work included under this Division shall include a complete mechanical system as shown on the drawings and as specified herein. Any apparatus, appliance, material or work not shown on the drawings but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the work complete in all respects and ready for operation, even if not particularly specified, shall be furnished, delivered and installed by the contractor without additional expense to the Owner.

B. The contractor shall note that all items of equipment are specified in the singular; however, the contractor shall provide and install the number of items of equipment as indicated on the drawings and as required for a complete system.

C. It is the intention of the specifications and drawings to call for finished work, tested, and ready for operation. Wherever the word "provide" is used, it shall mean, "provide and install complete and ready for use."

D. Minor details not usually shown or specified but necessary for proper installation and operations shall be included in the contractor's estimate, the same as if herein specified or shown.

E. This contractor shall be responsible for participation and coordination with the Commissioning process as specified in section 01 91 00.

1.3 APPLICABLE SPECIFICATIONS, CODES, STANDARDS AND PERMITS

A. All equipment, materials and installation shall conform to the requirements of national, state and local codes, laws, ordinances, rules and regulations. All utility connections shall conform to the requirements of the local utilities.
B. Unless otherwise specified herein or shown on the contract drawings, the work and materials shall conform to the applicable requirements of the following codes, standards and regulations:

1. VUSBC Virginia Uniform Statewide Building Code
3. ICC International Code Council
5. ARI Air Conditioning & Refrigeration Institute
6. ASHRAE American Society of Heating, Refrigerating and Air Conditioning Engineers
7. ASME American Society of Mechanical Engineers
8. ASTM American Society of Testing Materials
9. NEC National Electrical Code
10. NFPA National Fire Protection Association
11. OSHA Occupational Safety and Health Association
12. SMACNA Sheet Metal and Air Conditioning Contractors National Association
13. UL Underwriters Laboratories, Inc.
14. ANSI American National Standards Institute
15. AWS American Welding Society
16. NEMA National Electrical Manufacturer's Association
17. CISPI Cast Iron Soil Pipe Institute
18. IRI Industrial Risk Insurers
19. CAA Clean Air Act Amendment of 1990 (Title VI, Section 608)
20. CTI Cooling Tower Institute

C. Contractor shall give all necessary notices, obtain all permits and pay all Government taxes, fees and other costs, including costs for water, sewer, and gas connections or extensions including meters, in connection with his work, file all necessary plans, prepare all documents and obtain required certificates of inspection for work and deliver same to Owner before request for acceptance and final payment for work.

D. The contractor shall be responsible for purchasing equipment and appliances that bear the
label of an agency, as approved by CITY OF ALEXANDRIA. It shall be the responsibility of the contractor to pay for any label testing of equipment or appliances that are installed without the label of a CITY OF ALEXANDRIA approved agency.

1.4 SHOP DRAWINGS

A. The contractor shall submit eight (8) copies of the shop drawings to the Architect for review with ample time for checking prior to delivery of any of this equipment or material to the job site. The project's and the contractor's names shall be on each submittal.

B. Shop drawings shall be submitted on all major pieces of equipment and material. Each item of equipment proposed shall be a standard catalog product of an established manufacturer. The shop drawing shall give complete information on the proposed equipment such as: capacity, size, construction, material, dimensions, arrangement, operating clearances, performance characteristics, weight and rating authority. Each item of the shop drawing shall be properly labeled, indicating the intended service of the material.

C. The contractor shall, before submitting the shop drawings of the equipment to the Architect, check each item of the shop drawings to verify the proper equipment. Items to check shall include but not be limited to:

1) Will equipment physically fit into space;
2) proper equipment for the job; electrical characteristics;
3) voltage matches that of electric service; proper arrangements for connections;
4) meets code requirements.

D. The shop drawings shall be neatly bound and submitted to the Architect with a letter of transmittal, which shall list each item, submitted with the manufacturer's name.

E. Review of the shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings have been reviewed, said review does not mean that drawings have been checked in detail; said review does not in any way relieve the contractor from his responsibility or the necessity of furnishing material or performing work as required by the contract drawings.

1.5 EQUIPMENT DEVIATIONS

A. Where the contractor proposes to use an item of equipment other than the prototype equipment (a specified manufacturer's equipment used as the basis of design) or that detailed on the drawings which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical or architectural layout, all such redesign and all new drawings and detailing required therefore shall be prepared by the contractor at his own expense and be approved by the Owner and Engineer.

B. Where such deviation from the prototype equipment requires a different quantity and arrangement of materials and equipment, the contractor shall furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit and any other additional equipment required by the system at no additional cost to the Owner.
1.6 QUALIFICATIONS FOR BIDDERS

A. The contractor shall examine drawings and specifications relating to work of all trades and become fully informed as to the extent and character of work required and its relation to all other work in the project prior to submission of bid or prior to start of any construction covered by these specifications and drawings.

B. Before submitting bid the contractor shall visit the site and examine all adjoining existing building, equipment and space conditions on which his work is in any way dependent, for the best workmanship and operation according to the intent of the specifications and drawings. Contractor shall verify dimensions and fully inform himself as to the nature and scope of the proposed work and also the conditions under which it is to be conducted. He shall report to the Owner any conditions that in his estimation might preclude him from installing his equipment and work in the manner intended and noted on the drawings and in this specification. Failure to take the above precaution will in no way relieve the contractor from his obligations to provide the material and work as indicated and as specified without additional cost to the Owner or extension of completion time.

1.7 TEMPORARY FACILITIES

A. Are specified under Temporary Facilities, the General Conditions, Supplementary General Conditions, and Division 01. General requirements are hereby made a part of this section as fully as if repeated herein.

1.8 DRAWINGS

A. The drawings are diagrammatic, indicating general arrangement of work, and should not be scaled to establish location of work. The drawings show the size of piping and ductwork branches, risers and equipment, and must be followed. Where a change of location or method of running becomes necessary due to obstructions or other construction difficulties, such changes shall be made after securing approval of the Owner in writing and at no increase in amount of contract.

B. Decisions regarding any and all substitutions and options permitted by the specifications shall be submitted for approval to the Owner. Approval will only be recognized when in writing.

C. In finished spaces all piping and ductwork shall be concealed or run behind furring unless shown otherwise. Where concealing is not possible piping and ductwork may be exposed after obtaining the Owner's approval.

D. All horizontal piping and ductwork not run below slab on grade shall be run as close as possible to underside of floor and parallel to building lines. Maintain maximum headroom in all areas.

E. All vertical piping and ductwork shall be run as close to walls and partitions as practicable.

F. Coordination of all other trades prior to erecting any piping or ductwork is required to avoid conflict between various components of the building.

1.9 COOPERATION WITH OTHER TRADES
A. The contractor shall give full cooperation to other trades and shall furnish in writing, with copies to the Owner, any information necessary to permit the work of all trades to be installed satisfactorily with the least possible interference or delay.

B. Where the work of the contractor will be installed in close proximity to work of other trades, or where there is evidence that work will interfere with work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment. This contractor shall prepare composite working drawings at a scale not less than 1/4" = 1'-0" clearly showing how his work is to be installed in relation to the work of the other trades. If the contractor installs his work before coordinating with other trades or as to cause any interference with work of other trades he shall make necessary changes to his work to correct the condition without additional cost to the Owner.

C. The contractor shall furnish to other trades as required all necessary templates, patterns, setting plans and shop details for the proper installation of the work and for the purpose of coordinating adjacent work.

D. Structural support elements as shown on the drawings must be in place prior to the installation of piping or the setting of rooftop equipment. The contractor shall not install any piping or rooftop equipment until such elements are in place.

1.10 ELECTRICAL WIRING

A. The contractor shall, regardless of voltage, furnish and install all temperature control wiring, all interlock wiring, and equipment control wiring for the equipment that the contractor furnishes unless otherwise noted. Division 26 will furnish and install power wiring to the mechanical equipment and make electrical connections unless otherwise noted on the drawings.

B. All electrical wiring furnished under the mechanical contract shall conform with Division 26.

1.11 FOUNDATIONS AND SUPPORTS

A. Contractor shall provide all necessary foundations, supports, pads and bases required for mechanical equipment and any other equipment furnished under this contract, unless covered under the architectural or structural work.

B. For buried concrete or cast iron sewer piping installed in filled cuts over four (4) feet in depth the contractor shall provide brick or approved equal supports or piers under piping and fittings with piers or supports extending to a depth to provide sufficient firm and adequate support to overcome the possibility of any deflection in the piping system.

C. For pumps, compressors and other rotating machinery and all equipment where foundations are indicated, furnish and install concrete pads 4" in height (unless otherwise noted) extending not less than 4" beyond equipment base in all directions. Equipment installed in areas other than slab on grade shall be installed with the appropriate vibration assembly.

D. Construction of foundations, supports, pads, bases and piers where mounted on the floor, shall be of the same materials and same quality of finish as the adjacent and surrounding flooring material.
1.12 SCAFFOLDING, RIGGING AND HOISTING

A. Unless otherwise specified, contractor shall furnish all scaffolding, rigging, hoisting, shoring and services necessary for erection and delivery into the premises for any equipment and apparatus furnished and shall remove same from premises when no longer required.

1.13 EXCAVATION AND BACKFILL

A. The contractor shall be responsible for excavation, backfill, tamping, shoring, bracing, pumping, street cuts, repairing of finished surface and all protection for safety of persons and property as required for installing a complete mechanical/plumbing system. All excavation and backfill shall conform to the architectural section of the specifications.

B. It shall be the responsibility of the contractor to check the indicated elevations of utilities entering and leaving the building. If such elevations require excavations lower than the footing levels, the Owner shall be notified of such conditions and redesign shall be made before excavations are commenced. It is also the responsibility of the contractor to make the excavations at the minimum required depths in order not to undercut the footings.

C. The trench shall be excavated below the installation level of the bottom of the pipe. The trench shall be filled with sand or fine gravel so entire length of barrel of piping rests on solid bed of sand or fine gravel. The backfill shall be filled in layers of 6” max depth and such layers shall be compacted after each placement.

D. Excavation shall be made in a manner to provide a uniform bearing for pipes. The pipe elevation shall be determined by the contractor to meet the plumbing codes. Where rock is encountered, excavate 3” below pipe grade and back fill with sand to the installation level of the pipe. The pipe, including the joints, shall not rest on rock at any point.

E. After required test and inspections, backfill the ditch and tamp. The first foot above the pipe shall be hand backfilled with rock free clean earth. The backfill in the ditches on the exterior and interior of the building shall be tamped to 95% of the standard Proctor maximum dry density (ASTM D-698). The contractor shall be responsible for any of his ditch walls that cave in.

1.14 CUTTING AND PATCHING

A. On new work the contractor shall furnish sketches showing the locations and sizes of all openings and chases, and furnish and locate all sleeves and inserts required for the installation of the mechanical work before the walls, floors and roof are built. The contractor shall be responsible for the cost of cutting and patching where any mechanical items were not installed or where incorrectly sized or located. The contractor shall do all drilling required for the installation of his hangers.

B. On alterations and additions to existing projects, the contractor shall be responsible for the cost of all cutting and patching unless otherwise noted.

C. No structural members shall be cut without the approval of the Owner, and all such cutting shall be done in a manner directed by him. All patching shall be performed to match the existing surface in shape, texture and color.
1.15 ACCESSIBILITY

A. The contractor shall locate equipment, which must be serviced, operated or maintained in fully accessible position. Equipment shall include but not be limited to: valves, traps, or low limit devices, damper operators, motors, controllers, drain points, fusible links of fire dampers, fire dampers, filters, etc. If required for better accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility, and any change shall be approved. Motor starters shall be installed not more than 6'-0" above finished floor unless otherwise approved by the Owner.

B. All filters furnished with air handling equipment shall be readily removable from sides or bottom of cabinet as required by equipment location. Contractor shall verify location of all equipment and proper location of access to filters for removal before submitting shop drawings, placing order for equipment and setting and connecting of equipment. Any filters deemed by the owner to be inaccessible after installation will be made accessible by the contractor at no additional cost to the owner.

1.16 RECORD DRAWINGS

A. The contractor shall keep daily updated accurate records of all deviations in work as actually installed from work indicated on the contract drawings. The record drawings shall be kept at the job site, available to the Owner at all times and labeled as "Project Record Information - Job Set". When work is completed one complete set of marked-up prints shall be delivered to the Owner.

1.17 PERSONNEL INSTRUCTION AND OPERATING INSTRUCTIONS

A. The contractor shall submit for approval three (3) copies of all of the manufacturer's installation, operating and maintenance manuals for all new mechanical equipment listed in the equipment schedule, all necessary components of mechanical equipment, testing and balancing reports, equipment start-up records, equipment capacity (input and output) and a list of filter sizes and belt sizes for all mechanical equipment that requires filters and belts (this includes, but is not limited to, fan coils, unit ventilators, rooftop units, cabinet heaters, exhaust fans and air handlers). Submit four (4) copies of the operating and maintenance manuals for the automatic temperature control system components and diagrams for approval. A complete written narrative of how each system is intended to operate shall be included. Manuals shall be assembled in black vinyl hardback loose-leaf binders, labeled with job name, address and date. Information on each piece of equipment of system shall be in a separate tab labeled section. Provide a complete index of the contents. After approval by the Engineer the binders shall be forwarded to the Owner.

B. After all tests are conducted and approved as specified below, furnish a competent operating engineer for a period of two days to instruct and demonstrate to the Owner or his authorized representative the operation of the system. The mechanical systems demonstration shall not coincide with the electrical demonstration. Notify the owner in writing of the person to whom this instruction was given and the date it was given.

C. On phased construction projects the aforementioned equipment start-up records shall be completed and made available to the owner for review prior to the occupancy of the completed phase.

1.18 TESTS
A. The contractor shall, at his expense, conduct capacity and general operating tests on each system. The test shall demonstrate the specified capacities of the various pieces of equipment and shall be conducted in the presence of the Owner or his authorized representative. The general operating tests shall demonstrate that the entire equipment is functioning in accordance with the contract documents. Furnish all instructions and test equipment.

B. After all systems are completely tested, submit three copies of the test results to the Owner for approval before final acceptance of project.

1.19 EQUIPMENT AND SYSTEMS CHECKOUT AND START-UP

A. This contractor is responsible for the checkout and start-up of all equipment and systems. Equipment start-up shall be in accordance with the manufactures requirements and recommendations and shall be performed by personnel who are knowledgeable with the equipment and its requirements. When required by the equipment manufacturer or as noted in the specifications, equipment checkout and start-up shall be performed by personnel certified by the manufacturer. Evidence of proper certification of startup personnel shall be provided to the owner.

B. All checkout and start-up activities are the responsibility of this contractor.

C. This contractor shall notify CITY OF ALEXANDRIA two weeks prior to equipment checkout and start-up.

D. Systems and equipment shall be operated at both full and part load conditions to ensure specified requirements can be achieved.

E. The equipment manufacturer’s checkout and start-up logs shall be completed in their entirety; should a reference be non-applicable it shall be marked as such. Copies of completed logs shall be submitted to CITY OF ALEXANDRIA personnel the day of checkout and start-up activities, as well as included in the Operation and Maintenance manual.

1.20 WARRANTY

A. The contractor shall deliver the work described herein in a first-class operating condition in every respect. The contractor shall also warrant that the material, equipment and workmanship furnished shall be entirely free from defects for a period of one year. All apparatus will develop capacities and characteristics specified, and that if during the period of one year - from date of substantial completion (See Section 006500) any such defects in workmanship, materials or performance appear, he will, without cost to the Owner, remedy such defects within a reasonable time. In default thereof, Owner may have such work done and charge the cost to the contractor. In cases where equipment warranties through the manufacturer exceed the periods listed in these specifications, the manufacturer’s warranty shall take precedence. The contractor is responsible for all periodic service and maintenance required to maintain such warranties on completed work for the duration of the project (See Section 00 65 00). Once the entire project is substantially complete, periodic maintenance shall be the responsibility of the owner.

1.21 CONNECTING INTO EXISTING UTILITIES
A. Procedures: The procedures used for the accomplishment of connecting into existing work shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services.

B. Scheduling of Work: Work shall be performed in the sequence, locations and time periods agreed to by the Owner prior to commencement of work.

C. Dust Control: The amount of dust resulting from connecting existing utilities shall be controlled to avoid creation of a nuisance in the surrounding area. Masks shall be worn for protection against dust inhalation by all persons in the vicinity of work involving removal of masonry.

D. Protection of Existing Work:
   1. Existing work and furnishings to remain shall be protected from damage. Work damaged by the Contractor shall be repaired to match existing work without any additional cost to the Owner.
   2. Cover equipment as necessary, to protect it from dust.
   3. Floors shall be protected from damage.
   4. At the end of each workday and during inclement weather, close exterior openings with weatherproof cover.
   5. Provide temporary filter media on any portions of existing ductwork which communicate with corridors and construction areas. This media shall be checked frequently and changed as necessary.

E. Environmental Protection: Contractor shall comply with all Federal and local regulations pertaining to Environmental Protection.

F. Removal of Existing Equipment and Materials: Existing equipment and materials shall be dismantled and/or cut-up so as to be removable through existing building's access passages. No alterations to the building shall be made for the purpose of removing existing equipment and material.

G. Clean-up:
   1. Debris and Rubbish: Remove debris and rubbish from the site daily. Do not allow to accumulate in building or on site.
   2. Debris Control: Remove and transport debris in a manner so as to prevent spillage on site or adjacent areas.
   3. Regulations: Local regulations regarding hauling and disposal shall apply.

1.22 DOWNTIME

A. The contractor shall so arrange his work that domestic water, gas, storm sewer, sanitary
sewer, air conditioning, and heating systems shall be maintained at all times while the school classes are in session.

B. The contractor shall submit written requests to disconnect any existing utility services and to obtain equipment downtime. Only after receiving Owner approval of these requests shall work be allowed to proceed. This contractor shall be responsible for restoring the existing utilities.

C. If contractor fails to provide domestic hot/cold water, gas, sewers, air conditioning and/or heating systems as specified herein it is understood and agreed that there will be liquidated damages deducted in the amount as stated in Section 01 29 00, per school per consecutive calendar day.

1.23 CONSTRUCTION LIMITATIONS

A. In renewal projects which require work to be continually done, above the corridor ceilings, while school is in progress. The following requirements shall be met:

1. No construction material may be stored in a corridor at anytime.

2. Any work done in the corridors after school hours must allow a minimum corridor of 72" to remain for safe egress. No work such as welding, soldering, etc., which is considered hazardous to the occupants of the building, may take place during school hours.

3. The contractor shall immediately clean any area of debris, if work is done in any occupied space.

4. No gas powered construction equipment will be allowed in the building during school hours.

END OF SECTION
SECTION 23 05 93

TESTING, ADJUSTING AND BALANCING OF SYSTEMS

PART 1 - GENERAL

1.1 GENERAL

The Bidding and Contract requirements, Division 1 - General Requirements, Section 23 05 01 - General Provisions, and Section 23 05 00 - Common Work Results for HVAC shall apply to this section.

1.2 SCOPE

A. The testing, adjusting and balancing of the air distribution systems, hot water heating systems chilled water cooling systems and condenser water systems, are specified under Section 01 45 23.

B. The installers shall give notice when the systems are ready for testing, adjusting and balancing, and give assistance in adjusting and correcting deficiencies.

PART 2 - PRODUCTS

2.1 SHEAVES AND BELTS

A. The installer shall be responsible for providing and installing new fan or motor sheaves and belts when required to obtain the designed airflow.

2.2 AIR FILTERS

A. The installer shall be responsible for providing and installing new, clean, air filters. Filters shall be installed before final inspection and before giving notice for the testing, adjusting and balancing.

PART 3 - EXECUTION

3.1 GIVING NOTICE TO PROCEED

A. It shall be the responsibility of the installers to properly install, inspect and assure proper operation of each individual component of the system before giving notice to proceed with the testing, adjusting and balancing. The testing, adjusting and balancing shall not be performed until all mechanical equipment is properly installed and is 100 percent operational, all temperature controls are installed and calibrated and all systems are cleaned and clean filters installed.
B. The mechanical contractor shall set all outside air dampers to the approximate minimum position during equipment installation and prior to start-up of equipment.

C. The Balancing Contractor shall be responsible for properly plugging test holes which were made for testing purposes. Plugs shall be made of rubber and shall be sized to fit testing holes.

3.2 CORRECTION OF DEFICIENCIES AND ASSISTANCE

The installers shall assist in the testing, adjusting and balancing the systems, shall adjust the system and make corrections of any deficiencies found such as: motor starters and horsepower; improper sheave and belt sizes; missing, improperly installed or malfunctioning volume control dampers, air extractors, air terminals, air monitors, variable or constant volume boxes, power wiring, controls and any other items that prevent the completion of the testing, adjusting and balancing of the systems.

3.3 ADDITIONAL MATERIAL

Any additional items or material required to be installed in the ductwork system to implement the testing, adjusting and balancing shall be furnished under Section 01 45 23 along with the location. The installers shall install these items or materials.

3.4 COMMISSIONING RESPONSIBILITIES

This contractor shall be responsible for participation and coordination with the commissioning process as specified in section 01 91 00.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL

The Bidding and Contract Requirements, Division 01 - General Requirements, Section 23 00 01 - General Provisions, and Section 23 05 00 - Common Work Results for HVAC shall apply to this section.

1.2 SCOPE

Provide and install cabinet unit heater as shown on the drawings and specified herein.

1.3 QUALITY ASSURANCE

The cabinet unit heater shall have published ratings and be UL listed and bear the UL label.

1.4 SUBMITTALS

Provide shop drawings on this equipment as described in Section 23 05 01.

PART 2 - PRODUCTS

2.1 CABINET UNIT HEATERS

The cabinet unit heater shall be completely factory assembled and of the type, capacity and voltage shown on the drawings. The cabinet unit heater shall be manufactured by TRANE. Units fully equal to the specified manufacturer and manufactured by STERLING, RITTLING or AIRTHERM are acceptable.

A. Cabinet: All cabinets shall be constructed of galvanized steel panels, acoustically and thermally insulated with glass fiber blanket material. The cabinet shall be constructed of a minimum of 18-gauge steel on top and sides with 16 gauge front panels. Front panels of horizontal cabinet unit heaters shall be provided with a restraining device or hinges which hold this front panel securely when servicing. The interior chassis shall be constructed of not less than 16 gauge galvanized steel and coated with rust inhibiting paint. Cabinet shall have baked enamel finish with color selected from manufacturer's selection chart by the Architect.

B. Filters: Shall be one (1) inch thick throwaway type. Two complete set of spare filters shall be supplied in addition to the set used during construction.

C. Motor and Fan: Shall be direct driven, forward curved, centrifugal, double width type design for quiet operation. The motor shall be multi-speed, permanent split capacitor. Motor shall
have built-in thermal overload protection. The electric input shall not exceed those listed on drawings.

D. Controls: Fan control shall be from multi-speed fan switch located in cabinet unless otherwise noted. The cabinet unit heater shall be provided with low voltage (24v) controls by the manufacturer to interface with Division 25 ATC system. It shall have a strap on hot water aquastat located on the hot water supply to prevent the fan from running when hot water is not present.

E. Hot Water Heating Coil: The coil shall be factory tested and shall be suitable for working pressures up to 250 psig. Automatic air vents shall be provided. Coils shall be of copper tube/aluminum fin construction.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The cabinet unit heaters shall be installed as shown on the drawings and in accordance with the manufacturer's recommendations. The first unit installed will be considered the typical mock up and shall require notification, inspection and approval by designated owner representative and/or architect and engineer before any additional installations will be allowed.

B. Two sets of spare filters shall be provided in addition to the set used during construction with each unit. The filters shall be changed after the construction dust has been eliminated and before final inspection.

C. Provide a typed list of all the different units and their filter sizes to be included in the O & M manuals.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL

The Bidding and Contract Requirements, Division 01 - General Requirements, Section 23 05 01 - General Provisions, and Section 23 05 00 - Common Work Results for HVAC, shall apply to this section.

1.2 SCOPE

The work covered under this section shall include providing and installing the insulation on the items listed in this section or as shown on the drawings.

1.3 QUALITY ASSURANCE

All insulation shall have a composite fire hazard rating as tested by ASTM E-84, NFPA 25 or UL 723 not to exceed 25 flame spread, 50 smoke developed, and 50 fuel contributed.

1.4 SUBMITTALS

Provide shop drawings on proposed insulation as described in section 23 05 01. Shop drawings shall include proposed uses of all insulation components.

PART 2 - PRODUCTS

2.1 GENERAL

The manufacturer of the products specified in this section shall be OWENS-CORNING, CERTAIN-TEED, JOHNS-MANVILLE, ARMSTRONG, MANSON, or KNAUF.

2.2 PIPING INSULATION

A. The piping shall be insulated with heavy density rigid molded fiberglass pipe insulation with factory applied all service jacket (ASJ) with a 'K' factor not to exceed .25 @ 75°F mean temperature. The minimum insulation thickness for the various items shall be as follows:

1. Domestic Cold Water Piping and Cold Water Makeup Piping - 1/2". Exceptions: Exterior walls and plumbing chases shall be 1".

2. Trap Primer Supply Piping - 1/2" elastomeric, expanded closed cell, seamless pipe insulation from the drain tap to the trap primer valve or distribution unit.
3. Domestic Hot Water, Tempered Water and Hot Water Recirculating Piping - 1". Exceptions: Fixture runouts in interior plumbing chases and walls may be 1/2".

4. Storm Water (includes main and overflow piping) - The horizontal section of the rain leaders, riser to and including the interior part of the roof drains shall have 1" of insulation. The drain body and sump receiver of the roof drain shall have 1” of rigid fiberglass board insulation. Above slab piping serving open site drains shall have 1” pipe insulation from the open site drain to the rain leader.

5. Hot Water Heating Supply and Return
   a. Pipe Size 1-1/2” and Under - 1”.
   b. Pipe Size 2” and larger - 2”.

6. Chilled Water Supply and Return
   a. Pipe Size 3” and under – 1 ½
   b. Pipe Size 4” and larger – 2”

7. Condenser Water Supply & Return – 1-1/2”.

8. Condensate Piping - 1”.

9. Refrigerant Piping - 1” closed cell, semi-slit pipe insulation with a composite fire hazard rating as tested by ASTM E-84 not to exceed 25 flame spread and 50 smoke developed. Prototype: ARMSTRONG Armaflex AP.

10. Domestic water piping in the cells of masonry walls shall have be polyolefin pipe insulation such as “IMCOLOCK” with a ½ inch wall thickness

11. Where chilled/hot water piping is installed within the airstream of mechanical equipment, piping shall be insulated with flexible closed cell elastomeric pipe insulation. Insulation thickness shall be 3/4 inch.

B. Sheet Metal Saddles - See section 23 05 00.

C. Finish - Exposed Piping - Cover with 8 oz. canvas jacket.

   1. Exposed piping in the kitchen shall be insulated per the specification and covered with a PVC jacket 20 mil thick, white in color, washable and approved by the USDA and the FDA.

2.3 PIPING, FITTINGS, VALVES AND SPECIALTIES INSULATION

   A. Fittings, valves and specialties for the piping systems shall be insulated by two-piece molded fiberglass fittings with an insulating value equivalent to the pipe insulation. Acceptable alternative insulation methods shall be as described in paragraph 3.2 D.
B. The following piping, fittings, valves, and specialties shall be insulated.

1. Domestic cold water piping
2. Domestic hot water, tempered water and hot water recirculating piping
3. Hot water heating supply and return
4. Chilled water supply and return
5. Condensate piping
6. Condenser Water Supply & Return

C. Finish - Insulation on exposed piping fittings, valves and specialties shall be covered with an 8-oz. canvas jacket.

2.4 EQUIPMENT INSULATION

A. Chilled Water Pump, Chilled Water Standby Pump, Cooling Tower Pump and Cooling Tower Standby Pump- Pumps shall be encased with a sectional fabricated, flanged insulated split metal housing to provide ease of maintenance without damage to the insulation. Housing shall incorporate integral latching devices. Housing shall be tight sealing to prevent air infiltration. See drawing detail. All internal surfaces shall be insulated with 6 pounds per cubic foot density fiberglass board having a “K” value of 0.22@ 75 Deg F mean temperature with a factory applied all service jacket (ASJ). Minimum insulation thickness shall be one inch.

B. Chiller Cooler and Chilled Water Air Separators - All cold surfaces shall be insulated with one inch thick fiberglass insulation. 'K' factor shall not exceed 0.27 @ 75°F mean temperature with a density of 6.5 pounds per cubic foot. Chilled and hot water expansion tanks are not required to be insulated.

C. Finish - All insulation on chiller cooler and chilled water air separator shall be covered with an 8-oz. canvas jacket.

2.5 DUCTWORK INSULATION

A. Concealed Rectangular and Round Supply/Return, including flexible connections (horizontal FCU’s) And Outside Air Ductwork - Unless noted otherwise on the drawings shall be insulated with fiberglass duct wrap insulation at 1 pound per cubic foot density fiberglass board having a facing of laminated composite aluminum foil and kraft paper reinforced with a glass reinforcing, with a perm rating not exceeding .05. The 'K' value shall not exceed .29 @ 75 degrees F mean temperature. The duct wrap insulation shall have a minimum thickness of 2 inches. Insulate flexible connections on horizontal fan coil units.

B. Exposed Rectangular Supply/Return and Outside Air Ductwork - Unless noted otherwise on the drawings shall be insulated with 6 pounds per cubic foot density fiberglass insulating board having a facing of laminated composite aluminum foil and kraft paper reinforced with a glass reinforcing with a perm rating not exceeding .05. The 'K' value shall not exceed .23 @ 75°F mean temperature. The duct board shall have a minimum thickness of 1-1/2 inches. Exposed ductwork shall include but is not limited to, ductwork in accessible attics, equipment mezzanines, boiler rooms and equipment rooms The
exposed rectangular supply/return and outside air ductwork shall also be covered with an
8-ounce canvas jacket and be prepared for painting.
C. See Section 233100 for description of any additional ductwork that shall be lined.

PART 3 - EXECUTION

3.1 GENERAL

A. All insulating material shall be installed in accordance with the manufacturer's recommendations by personnel regularly employed in the pipe, duct and equipment insulating trade.

B. The insulation shall not be applied until all surfaces are clean and dry and until inspected and released for insulation application.

C. A complete moisture and vapor seal shall be provided on cold surfaces where vapor barrier jackets or coatings are required. Anchors, hangers, and other projections shall be insulated and vapor sealed to prevent condensation.

D. Pipe or duct insulation shall be continuous through walls and floor openings except where walls or floors are required to be fire stopped or required to have a fire resistance rating.

3.2 PIPE INSULATION APPLICATION

A. Pipe insulation shall be installed in accordance with the manufacturer's instructions.

B. Piping (except refrigeration piping) - Butt all joints firmly together. Ends of pipe insulation shall be sealed off with a vapor barrier coating at all fittings and valves. The insulation laps and butt strips shall be sealed by one of the following methods:

1. Insulation without self-seal laps shall have lap adhesive manually applied to all laps and butt strips. Stapling is not acceptable.

2. Insulation with self-seal laps shall have lap adhesive manually applied to the outside of all laps and butt strips after installation. Stapling is not acceptable.

C. Refrigeration Piping and domestic water piping using closed cell insulation – Butt joints and seams shall be joined together with contact adhesive Prototype-Armstrong 520 or manufacturer’s recommended adhesive. Both surfaces to be joined shall be coated with the adhesive.

D. Fittings and Valves - Shall be insulated with molded fiberglass fittings, segments of pipe covering, or with firmly compressed foil faced fiberglass blanket. Mitered joints are not acceptable. Secure in place with 20 gauge corrosion resistant wire and apply a smoothing coat of insulating cement. Vapor seal by applying a layer of open weave glass cloth fabric embedded between flood coats of vapor barrier mastic. Lap glass fabric 2 inches onto adjacent pipe. PVC covers are acceptable only if the item covered is fully insulated first. Insulation shall be installed so the cover cannot be deformed. Contractor shall request an
inspection by the Owner of the insulated items prior to cover installation.

E. Finish - All exposed piping, and piping fittings, valves and specialties insulation shall receive an 8 oz. canvas jacket smoothly pasted in place with lagging adhesive and sized with one brush coat of lagging adhesive. The finished surface shall be suitable for painting. Exposed piping includes piping in accessible attics, equipment mezzanines, boiler rooms and equipment rooms.

F. Outdoor Piping - Weatherproofing Finishes for All Outdoor Insulation.

1. Piping - Apply aluminum metal jacket 0.016" with moisture barrier around pipe and slip edge into preformed Z lock positioned to shed water. Butt next jacket section leaving approximately 3/8" gap. Place preformed 2" butt aluminum band and wing seal.

2. Fittings - Apply prefabricated metal fittings in composition to pipe jacketing.

G. Sheet Metal Saddles shall be provided and installed on all pipe hangers as stated under section 23 05 00.

H. Pipe Insulation Support - All insulated piping shall be supported at hanger and sleeve locations by either using a high density pipe insulation or wooden blocking, installed inside the vapor barrier for all pipe sizes one inch and larger. High-density pipe insulation shall be of the type as recommended by the manufacturer and shall be substituted for no less than the bottom half section of the fiberglass pipe insulation. The lengths of the high-density insulation shall be at least two inches longer (each end) than the length of the saddle. The lengths of wooden blocking shall be eight inches. Wooden blocking shall be the same thickness as the pipe insulation, the same width as the pipe, shall be tapered within the insulation and shall be centered at the hanger. Remove portions of the fiberglass pipe insulation by peeling back the factory applied all service jackets from the insulation and cut out and replace the required sections for either method of insulation support. Re-wrap the vapor barrier to completely enclose the installation. Manually apply lap adhesive to the outside lap and apply butt strips. The installations shall also meet any additional requirements recommended by the insulation manufacturer.

I. Underground Pipe Insulation

1. Insulation- insulation shall be cellular glass insulation manufactured in accordance with ASTM C 552. The insulation shall be fabricated in half sections wherever possible. For large diameter piping where half sections are not practical, curved sidewall segments are permitted.

2. Jacketing- a 50 mil (1.3mm) thick self-sealing, modified bituminous membrane reinforced with a glass fabric, and a 1mil (0.3mm) aluminum top film on the outer surface.

3. Mastic- shall be asphalt cutback mastic.

4. Reinforcing Fabric- shall be open mesh polyester fabric with 6x5.5
mesh/inch configuration.

5. Sealant- shall be a non-setting butyl sealant.
6. Banding- shall be ½ inch aluminum or fiberglass reinforced nylon for insulated lines with OD’s of 48 inches or less.

3.3 EQUIPMENT INSULATION APPLICATION

A. Chiller Cooler and Chilled Water Air Separators - Shall be insulated with fiberglass insulation cut to a smooth uniform fit with butting edges. Complete installation shall not have wrinkles, bulges or overlapping edges. Secure insulation to all surfaces with adhesive designed for that purpose.

B. Finish - All insulation on chilled water chiller cooler and chilled water air separator shall be covered with an 8-oz. canvas jacket installed as described in paragraph 3.2D.

3.4 DUCTWORK INSULATION APPLICATION

A. Fiberglass Duct Wrap Insulation - The duct wrap insulation shall be secured to the ductwork with fire retardant adhesive in sufficient quantities to prevent sagging. Ducts with a width of over 30" shall be further secured on the underside with mechanical fasteners on 18" maximum centers. Insulation shall be butted with facing overlapping all joints at least 2" and sealed with fire retardant vapor barrier adhesive. Seal all breaks and punctures with vapor barrier tape and same type of fire retardant adhesive. Stapling is not acceptable.

B. Fiberglass Insulating Board Application

1. The insulating board shall be secured to the ductwork with mechanical fasteners. The fasteners shall be spaced 12" to 18" on center with a minimum of two rows per side of duct. Secure insulation in place with washers firmly embedded in insulation. Seal all joints, breaks and punctures with fire retardant vapor adhesive reinforced with a 3" wide strip similar to that of facing.

2. Finish - A glass cloth shall be applied over the facing into a wet coat of fire retardant adhesive, overlapping seams at least 2". Apply finish coat of same fire retardant adhesive.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL

The Bidding and Contract Requirements, Division 01 - General Requirements, section 23 05 01 - General Provisions, and Section 23 05 00 - Common Work Results for HVAC shall apply to this section.

1.2 SCOPE

The refrigeration piping system shall be provided, installed, tested, evacuated and charged.

1.3 QUALITY CONTROL

The refrigeration piping system shall be provided, installed, tested, evacuated and charged in accordance with the manufacturer's recommendations, ANSI, ASHRAE, and ARI's Safety Code for Mechanical Refrigeration, state and local codes.

1.4 SUBMITTALS

Provide shop drawings on the proposed system as described in Section 23 05 01.

PART 2 - PRODUCTS

2.1 GENERAL

The refrigerant piping system shall be provided complete and installed in accordance with the manufacturer's recommendations and as specified herein. The size of the refrigerant pipes shall be obtained from the equipment manufacturer unless otherwise shown on the drawings.

A. Pipe, Fittings and Accessories - The pipe shall be type ACR 'L' copper refrigerant tubing with hard wrought copper fittings. Pipe sized ½ inch and larger shall be hard drawn. Pipe size 3/8 inch and smaller can either be hard or soft drawn. All of the joints shall be brazed with a filler material that complies with AWS classification BCuP-5. A sight glass with moisture indicator shall be provided if not provided with equipment (not required on VRF systems). A removable type SPORLAN cartridge type drier-strainer shall be installed in the liquid line with a three-way valve by-pass if it is not provided on the equipment (not required on VRF systems). Use type 'L' copper tubing to pipe the relief valve discharge to the outside.

B. Condensate Drain Piping - Shall be type 'L' copper tubing.

C. Pipe Hangers and Supports - Shall be as required in section 23 05 00.

D. The piping shall be insulated as shown in section 23 07 13.
PART 3 - EXECUTION

3.1 GENERAL

The Refrigeration Piping System shall be installed in accordance with the manufacturer's recommendations as shown on the drawings and as specified herein.

A. Installation- During brazing an inert gas (such as nitrogen) shall be continuously passed through the system at a rate sufficient to maintain an oxygen free environment to prevent the formation of copper oxide scale. After piping has been completed, the refrigerant piping system shall be pressure tested at a pressure of 300 psi on the high side and 150 psi on the low side. The pressure shall be maintained on the system for a minimum of 12 hours. The system shall be evacuated when the surrounding ambient air is not less than 60°F. If the temperature is less, auxiliary heat must be provided to insure proper evacuating conditions. A minimum vacuum of 500 Microns of Hg. shall be pulled on the system and maintained for 12 hours. The vacuum pump displacement shall be not less than 2 cfm for up to 15 tons.

B. The system shall be charged as recommended by the equipment manufacturer.

END OF SECTION
PART 1 – GENERAL

1.1 GENERAL

The Bidding and Contract Requirements, Division 01 - General Requirements, section 23 05 01 - General Provisions, and Section 23 05 00 - Common Work Results for HVAC shall apply to this section.

1.2 SCOPE

The work covered under this section shall include the following:

A. Complete hot water piping systems.
B. Complete hydronic heat pump loop water piping systems.

1.3 QUALITY ASSURANCE

The piping system shall be tested for leaks before the insulation is applied and before the piping system is covered up. The test shall be at least 100 psi of water pressure for a duration of 12 hours.

All grooved couplings, and fittings, valves and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

1.4 SUBMITTALS

Provide shop drawings on this equipment as described in section 23 05 01. Shop drawings shall include proposed uses of all items.

PART 2 - PRODUCTS

2.1 PIPING AND FITTINGS

A. Heat Pump Loop Supply and Return - Shall be schedule 40 black steel pipe with 125 psi cast iron screwed fittings or 150 psi steel weld fittings.

1. Type "L" copper tubing with copper fittings is acceptable for piping 2" and under.

B. Hot Water Supply and Return - Shall be schedule 40 black steel pipe with 125 psi cast iron screwed fittings or 150 psi steel weld fittings.
1. Type "L" copper tubing with copper fittings is acceptable for piping 2" and under.

C. Cooling Tower Water Supply and Return – Shall be scheduled 40 black steel pipe with 125 psi cast iron screwed fittings or 150 psi steel weld fittings inside of the building and schedule 80 PVC plastic pipe and fittings for outdoors.

D. Cold water make up - Shall be type 'L' copper tubing with copper fittings.

E. Grooved mechanical pipe couplings, fittings, valves and other grooved components may be used as an option to welding, threading or flanged methods. All grooved components shall be of one manufacturer and conform to local code approval. Grooved end product manufacturer to be ISO-9001 certified. Grooved couplings shall meet the requirements of ASTM F-1476. Grooved components shall be manufactured by VICTAULIC. Grooved components manufactured by GRINNELL or ANVIL INT. are acceptable providing all aspects of the specification are met. No substitutions.

1. Carbon steel piping shall be roll grooved in accordance with manufacturer's current listed standard.

2. Mechanical couplings for grooved piping shall be cast of ductile iron conforming to ASTM A-395, grade 65-45-15, and ASTM A-536, grade 65-45-12. Couplings shall be rigid style and be of the angle patterned bolt pad type, and shall provide system support and hanging requirements in accordance with ANSI 831.1, ANSI B31.4 and NFPA 13. Coupling bolts and nuts shall be zinc plated (ASTM B-633) heat treated carbon steel track head conforming to physical properties of ASTM A-183. Mechanical couplings shall be coated with an alkyd enamel finish.

3. Gaskets for grooved pipe and fittings shall be grade "E" EPDM compound conforming to ASTM D-2000 designation 2CA615A25B24F17Z.

4. Rigid Type: Coupling housings with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with ANSI B31.1, B31.9, with Victaulic Style 107H/107N (Quick-Vic), Installation ready rigid coupling for direct stab installation without field disassembly. Gasket shall be Grade "EHP" EPDM designed for operating temperatures from -30 deg F to +250 deg F.

5. Grooved fittings shall be cast of ductile iron conforming to ASTM A-395, grade 65-45-15, and ASTM A-536, grade 65-45-12, wrought steel to ASTM A234, Grade WPB; or factory-fabricated from ASTM A53 steel pipe. Grooved fittings shall be coated with an alkyd enamel finish. Grooved fittings shall be full flow.

F. Condensate drain piping - Shall be type 'L' copper tubing and fittings.

G. Runouts to terminal units with copper pipe connections - Type 'L' hard drawn copper tubing shall be used for runouts where required. A brass coupling shall be used between the steel pipe and copper tubing connection.

H. Hot water supply and return under slab - Each piece of equipment shall have separate runouts and shall be type 'K' continuous copper pipe with no joints allowed below slab.
All joints above slab shall be made with copper brazing rods. The entire underground pipe system shall be inside a minimum 6" round schedule 40 plastic pipe sleeve. Pipe shall be insulated; see section 230713.

I. The use of running or close nipples is prohibited.

2.2 VALVES

Valves shall be manufactured by VICTaulIC, STOCKHAMD, JENKINS, HAMMOND, JOMAR, MILWAUKEE, FAIRBANKS, CRANE, CONBRACO INDUSTRIES, INC., APOLLO VALVES, LUNKENHEIMER, WALWORTH, NIBCO, JAMESBURY, or ROCKWELL unless otherwise shall be rated for the medium served.

A. Gate valves 2-1/2" and smaller - Shall be cast bronze body, sweat type or screwed ends and solid wedge disc with rising stem, STOCKHAMD #B108.

B. Gate valves larger than 2-1/2" - Shall be iron body flanged ends and solid wedge disc with rising stem (OS & Y type), STOCKHAMD #G623.

C. Globe valves 2-112" and smaller - Shall be cast bronze body, sweat type or screwed ends and replaceable composition disc, STOCKHAMD #B24T.

D. Check valves 2-1/2" or smaller - Shall be cast bronze body swing check with either screwed ends or sweat type and with regrinding disc, STOCKHAMD #B319 or B309.

E. Check valves larger than 2-1/2" - Shall be flanged iron body with bronze disc and ring, STOCKHAMD #G931.

F. Non-Slam check valves - Shall be used for all vertical applications and on pump discharge piping and shall be flanged iron body with bronze disc, wafer check, NIBCO #F910 for 2W and larger or W910 for 2" and smaller.

G. Butterfly valves - 2" and larger may be used in lieu of gate or globe valves except at boiler supply and return pipe. These valves shall be rated at not less than 150 psi WOG Class and be suitable for use with 180°F water. Shall be lug type for pipe removal on either side of valve, shall have stainless steel shafts and shall have 4" extended stem lengths for all size valves. STOCKHAMD #LD611.

H. Ball valves - 2" and smaller may be used in lieu of gate or globe valves. These valves shall be bronze, rated at not less than 150 psi WOG Class, full port, solid chrome plated ball design and stem, blow out proof stem. Be suitable for use with 180-degree water and provided with extended insulated handles. STOCKHAMD #5216. Extended insulated handles shall be APOLLO VALVES "Therma-Seal" or NIBCO "Nib-seal".

I. Balancing valves - Valves manufactured by FLOWSET, GRISWOLD, GERAND, DANFOSS, BARCO, PRESO, FLO-PAC, or NUTECH with memory stop, positive shutoff, extended insulated handle and PIT type ports for balancing. Flowset model AS size "A" to 2" flow 0.25 GPM to 100 GPM. For all units with runouts 2" and smaller.
J. Constant volume flow valves – VICTAULIC, GRISWOLD, AUTOFLOW, or FLOWSET, automatic pressure-connecting spring and cartridge type valves with quick disconnect pressure taps. For all units with pipe size 2-1/2" and larger with GPM capacity shown.

K. Valve operating chains - Valves installed six feet or more above finished floor in boiler rooms or mechanical rooms shall be chain operated. Provide chain and chain wheel with chain guide of size required, as manufactured by STOCKHAM.

L. Balance valve for pump - Eccentric, combination shut-off and balancing with memory stop valve as manufactured by DEZURIK or ROCKWELL.

M. Provide metering device in boiler room or in pump room for measuring pump flow rates, for systems piping a minimum of 20 feet (measured along pipe length) from pump discharge or just before pipe exits room, whichever is greater. Provide extended metering taps on metering devices. Flow metering devices and elements shall be as manufactured by FLOWSET, PRESO, GERAND, GRISWOLD, or BARCO.

N. Valves for flushing piping mains - Provide 1 1/2" full port ball valves on the supply and return mains of each piping system for the purpose of flushing debris and other foreign matter out of piping. Valves shall be rated at not less than 150 PSI WOG, shall be suitable for 180°F water and provided with extended insulated handle. Provide adapter for valve to accept a fire hose and provide a removable cap. STOCKHAM #S207.

2.3 SPECIALTIES

A. Pipe Hangers and Supports - See section 23 05 00.

B. Unions - Shall be provided for the assembly, dismantling or service to any portion of the piping system.
   1. Unions 2" and Smaller - Shall be malleable iron ground joint unions with brass to iron seals. Stockham Fig. #694.
   2. Unions 2-1/2" and Larger - Shall be of the companion flange type with ring type gasket painted with graphite before installation. Stockham Fig. #799.
   3. Brass Couplings - Shall be used for connecting steel pipe to copper tubing.

C. Thermometers - Shall be provided and installed in the supply and return piping of the system. Thermometers mounted at heights other than 5 feet from the floor shall be the adjustable angle type and located so they may be read from the floor. The body of the thermometer shall be brass or die-east aluminum and at least 9" long. The thermometer shall be blue organic filled type with an appropriate scale for the medium being measured. The thermometer shall be mounted in the pipe in a separate well. Manufacturer - TRERICE BX 91406 or equivalent by WEKSLER, TAYLOR, or WEISS.

D. Pressure Gauges - Shall be installed in the piping system at the pumps. Connect the gauge to the piping system with 1/4" iron pipe. Provide 1/4" rough brass cock between the gauge and piping system. The pressure gauge shall be of the liquid filled, bourdon-tube type with at least a 4" diameter dial with an appropriate scale. The gauge shall be the dust, corrosion
and moisture resistance type with a cast aluminum case. Manufacturers ASHCROFT, WEKSLER, TAYLOR, or TRERICE.

E. Expansion Tank - Shall be ASME labeled and the size listed on the drawings. Provide the tank with the required tappings and a prime coat of paint. The expansion tank shall be BELL & GOSSETT, TACO, JOHN WOOD, WESSELS, or ARMSTRONG.

F. Tank Fitting - Shall match the tank to maintain the proper amount of air. The tank fitting shall be BELL & GOSSETT or TACO.

G. Air Separator: Shall be ASME labeled and the same size as connecting pipe. Provide separator with strainer. The air separator shall be BELL & GOSSETT, TACO, THRUSH, AMTROL, JOHN WOOD, or ARMSTRONG.

H. Pressure Reducing Valve - Shall be set at 12 psi unless otherwise noted on drawings and shall be the size of the cold water make up piping. The pressure-reducing valve shall be CONBRACO INDUSTRIES INC., APOLLO VALVES, WATTS, BELL & GOSSETT, or TACO.

I. Flexible Connection - Flexible pipe connection shall be installed on all pipes connecting to equipment where indicated on the drawings. The isolated equipment shall be provided with flexible connections for all piping connections immediately adjacent to the equipment. The hose shall be flexible, braid-reinforced, seamless metal hose within the pressure and temperature range applicable. Hose lengths shall be a minimum of ten inches and as recommended by the manufacturer, whichever is greater. Short style will not be acceptable. Provide control rods for stabilization. Flexible connections shall be as manufactured by METRAFLEX, KEFLEX, SSI, or METRASPHERE.

J. Air Vents - Provide at high points of systems, on trapped sections of piping with automatic air vents or other locations as required for air removal from the system. Manual air vents shall be used on piping above ceilings in all finished spaces. Each air vent shall be accessible. Provide Hoffman No. 77 manual air vents for unit heaters, fan coil units, unit ventilators, piping mains above ceilings, etc. Provide Hoffman No. 79 automatic air vents for all exposed piping mains, air handling units, etc. Air vents as manufactured by SPIROTHERM shall also be acceptable.

K. Strainers - Shall be VICTAULIC, CONBRACO INDUSTRIES, INC., APOLLO VALVES, ARMSTRONG, TACO, or SARCO. Iron or brass body 'Y' pattern sediment strainers shall be installed. These strainers shall be provided with stainless steel or non-ferrous straining elements with heads for removal of the elements.

1. Iron body 'Y' pattern sediment strainers shall be installed with steel pipe.

2. Brass body Y pattern sediment strainers shall be installed with copper or brass pipe.

3. Area of strainer openings shall not be less than four (4) times the pipe area. All strainers shall have blow-off valves with hose ends.

4. Strainer elements shall be No. 10 (ten) mesh screen or perforated stainless steel.
5. Each strainer body shall be cast with the manufacturer's name, an arrow indicating the direction of flow, strainer size and pressure classification.

6. Each strainer shall be of the operating pressure, temperature and service rating of the respective systems.

L. Check valves (condensate drains): See Section 23 22 00.

M. Condensate Overflow Protection - Provide float control safety switches in condensate drain pans (or secondary drain pans), for all equipment with cooling coils. Switches shall be as manufactured by BECKETT or LITTLE GIANT. Equipment located outside of plenum spaces may use safety switches as manufactured by EZ-TRAP (1-877-439-8727), where the switch is integral to a PVC trap.

N. Low point drains shall be provided for sections of trapped piping. Low point drains shall be a $\frac{3}{4}$" ball valve with a hose end connection and cap.

2.4 WATER PIPING ELECTRICAL HEAT TRACING:

A. Provide and install for all exterior piping RAYCHEM Corporation, XL-Trace, U/L Listed, braided self-regulating heating cable with inherent temperature control and a 5 foot cold lead inside the building. Electrical characteristics 208/1/60. All piping shall have Model 5XL-CR heat tracing. Nominal watts per foot rating at 40 degree pipe temperature is 5.9 for Model 5XL-CR. Provide Models XLK-PC and XLK-SET components for power connection, tees, end seals kits and splices and GT-66 glass cloth adhesive tape. Heat tracing cable equal to the item specified as manufactured by THERMON shall be acceptable.

B. Cooling Tower heat tracing shall include supply and return piping, makeup water piping, water treatment piping, drain and overflow piping, electronic water level piping, spray pump suction piping, spray pump body (excluding motor), and spray pump discharge piping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The piping systems shall be installed as described in section 23 05 00 - Common Work Results for HVAC.

B. Heat tracing cable shall be installed linearly along the piping, not spiraled. Secure heat tracing to piping using glass cloth adhesive tape. Provide manufacturer's recommended pattern coverage for valves, flanges and pipe supports. Heat tracing shall be installed on all exterior piping to five feet inside the building beyond the pipe sleeve. Heat tracing shall be tested, after installation, per manufacturer's recommendations. Heat traced piping shall have manufacturer's warning labels installed stating that the piping is electrically heat traced. This contractor shall install heat trace in such a manner that the termination points are coordinated with the electrical drawings.

C. Float control safety switches shall be interlocked with the fan to turn off the unit when a high water level is detected.

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Alexandria, Virginia
PE Project 72641.00.0

CONDENSATE DRAIN PIPING
23 26 00 - 6
November 4, 2019
3.2 PIPING SYSTEM CLEANING

A. The piping systems shall be cleaned and flushed with chemicals in accordance with the following sequences:

1. Initial Flush - The initial flush shall be performed on the piping mains, with pumps running and before any branch piping or equipment has been connected. This initial flush is to remove debris and other foreign objects out of the piping systems. Flush systems until all matter has been removed from piping. After this flushing, the strainers shall be opened, screens removed and the entire unit cleaned and re-installed.

2. Pre-Cleaning - After the initial flush, the piping mains shall then be pre-cleaned for a minimum of eight hours with the pumps running and before any branch piping or equipment has been connected with cleaning chemicals provided by the water treatment contractor. After the pre-cleaning, the strainers shall be opened, screens removed and the entire unit cleaned and re-installed.

3. Cleaning - After equipment and branch piping has been installed, the entire piping systems shall then be cleaned out for a minimum of eight hours with the pumps running, all 3-way valves open to equipment coils and all valves open in the systems to allow complete circulation of cleaning chemicals. The water treatment contractor shall provide the cleaning chemicals required to perform this cleaning. After piping system cleaning, all strainers shall be opened, screens removed and the entire unit cleaned and re-installed.

4. Flushing - After the piping systems cleaning, the systems shall then be refilled with water and circulated for a minimum of two hours, followed by draining the entire systems. The hot water system shall be brought up to operating temperature for this procedure. After systems draining, the air control tank strainer shall be removed and cleaned.

5. pH Balance and Treatment - After the two hour flush but before the water balance, the piping systems shall be flushed until the total alkalinity of the rinse water is equal to that of the make-up water. Once this has been completed, the systems shall be refilled with clean water and shall be treated per Section 232500. The treatment shall be performed by the water treatment contractor.

B. The piping systems cleaning and flushing shall be witnessed and verified by the Owner's representative. The contractor shall verify in writing that the cleaning and flushing of the piping systems has been performed and shall have the signature of the Owner's representative.

C. The mechanical contractor shall provide the water treatment contractor the capacities of the systems so that proper dosages of products will be used.

D. Valves for flushing piping mains shall be located at the low points in the mains. Mains shall be flushed before any branch piping or equipment is connected. Renewal projects which must have piping mains installed in phases shall have separate valves installed for each phase.
3.3 GROOVED PIPING

A. Pipe ends shall be clean and free from indentations, projections and roll marks in the area from the pipe end to groove for proper gasket sealing.

B. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service.

C. The use of bolted branch outlets is not permitted.

D. Outlets for wells and gauges etc. shall be made using welded "thread-o-lets".

E. All grooved components shall be of one manufacturer.

F. Grooved connections shall not be installed in inaccessible concealed locations.

G. Grooved joints shall be installed in accordance with the manufacturer’s latest published installation instructions.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL

The Bidding and Contract Requirements, Division 01 - General Requirements, Section 23 05 01 - General Provisions and Section 23 05 00 - Common Work Results for HVAC shall apply to this section.

1.2 SCOPE

The work covered under this section of the specifications shall include furnishing and installing the ductwork, accessories, associated items and all necessary connections to outlets, inlets and equipment required for a complete system as shown on the drawings and hereinafterspecified.

1.3 QUALITY ASSURANCE

A. Galvanized sheet metal shall meet the requirements of ASTM A653 and A924 standards.

B. Ductwork and duct accessories shall meet the requirements and recommendations of SMACNA standards, SMACNA Duct Cleanliness for New Construction (Advanced Level), UL-181 standard and ASHRAE recommendations.

C. The installation of ductwork and duct accessories shall comply with NFPA standard 90A and state and local codes.

1.4 SUBMITTALS

Provide shop drawings on ductwork materials and accessories as described in Section 23 31 00. Shop drawings are not required for duct layouts.

PART 2 - PRODUCTS

2.1 DUCTWORK SYSTEM CLASSIFICATION

For determination of ductwork construction criteria, all ductwork systems shall be classified as either low or medium pressure according to the following velocities or pressures. In all cases the higher of the two values shall be used to determine the system classification unless other overriding considerations are established on the drawings or in the specifications. A ductwork system is defined as, the complete run of a supply, return, exhaust, or intake air system, each classified individually.

A. Ductwork systems with any portion having an average cross-sectional velocity up to and including 2000 FPM and not exceeding 2" w.g. maximum static pressure at any point in the system shall be classified as low pressure.
B. Ductwork systems with any portion having an average cross-sectional velocity exceeding 2000 FPM or exceeding 2” w.g. maximum static pressure at any point in the system shall be classified as medium pressure.

C. All Variable Air Volume (VAV) supply air duct systems and all air duct systems outside exposed to weather regardless of velocity and pressure conditions are classified as medium pressure and shall be constructed in compliance with SMACNA's three (3) inch pressure classification, formerly 'High Pressure Duct Construction Standard.' Joints and seams shall be sealed as described in this specification.

2.2 DUCT MATERIALS

A. All ductwork, housings, dampers, access doors and all other duct related accessories shall be formed from galvanized steel sheets unless otherwise noted.

B. All angles used for reinforcement, support, hanging and other construction uses shall be galvanized steel and shall be equal to that used for ductwork. Galvanized angle iron shall be used where required by SMACNA standards.

2.3 DUCTWORK CONSTRUCTION

A. The low pressure ductwork as defined in Article 2.01 shall be constructed in accordance with the one (1) inch pressure classification, as described in SMACNA’s “HVAC Duct Construction Standards – Metal and Flexible”.

B. Ductwork classified as other than low pressure shall be constructed in accordance with the three (3) inch pressure classification, as described in SMACNA’s “HVAC Duct Construction Standards – Metal and Flexible”.

C. Duct sizes are shown on the drawings in inches. The dimensions given establish the free or unobstructed area required on the inside of the duct. In case a duct size is not shown the dimensions shall be requested from the Architect.

D. The ductwork shall be fabricated from field measurements to avoid conflict with beams, columns, pipes and other obstructions. Where necessary to avoid obstructions, the ductwork shall be transformed, divided or moved to one side as long as the free area is not reduced and such changes meet the approval of the Architect.

E. Kitchen Hood and Dishwasher Exhaust ductwork – Ductwork above the hood and through the roof to the exhaust fan shall be 22 gauge galvanized. Ducts subject to positive pressure shall be constructed, joined and sealed in the approved manner.

F. The minimum thickness of the sheet metal shall be either as described in SMACNA’s “HVAC Duct Construction Standards – Metal and Flexible” or as shown in the following table:
DUCT CONSTRUCTION MINIMUM SHEET METAL GAUGES

RECTANGULAR DUCTS

<table>
<thead>
<tr>
<th>Maximum side (inches)</th>
<th>Steel</th>
<th>Aluminum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Minimum Galvanized</td>
<td>(Minimum B &amp; S Gauge)</td>
</tr>
<tr>
<td></td>
<td>Sheet Gauge)</td>
<td></td>
</tr>
<tr>
<td>Thru 12&quot;</td>
<td>26 (0.022 inches)</td>
<td>24 (0.020 inches)</td>
</tr>
<tr>
<td>13&quot; - 30&quot;</td>
<td>24 (0.028 inches)</td>
<td>22 (0.025 inches)</td>
</tr>
<tr>
<td>31&quot; - 54&quot;</td>
<td>22 (0.034 inches)</td>
<td>20 (0.032 inches)</td>
</tr>
<tr>
<td>55&quot; - 84&quot;</td>
<td>20 (0.040 inches)</td>
<td>18 (0.040 inches)</td>
</tr>
<tr>
<td>Over 84&quot;</td>
<td>18 (0.052 inches)</td>
<td>16 (0.051 inches)</td>
</tr>
</tbody>
</table>

ROUND DUCTS

<table>
<thead>
<tr>
<th>Diameter (inches)</th>
<th>Spiral Seam Duct Steel (Minimum Galvanized Sheet Gauge)</th>
<th>Longitudinal Seam Duct Steel (Minimum Galvanized Sheet Gauge)</th>
<th>Fittings Steel (Minimum Galvanized Sheet Gauge)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thru 12&quot;</td>
<td>28 (0.019 in.)</td>
<td>26 (0.022 in.)</td>
<td>26 (0.022 in.)</td>
</tr>
<tr>
<td>13&quot; - 18&quot;</td>
<td>26 (0.022 in.)</td>
<td>24 (0.028 in.)</td>
<td>24 (0.028 in.)</td>
</tr>
<tr>
<td>19&quot; - 28&quot;</td>
<td>24 (0.028 in.)</td>
<td>22 (0.034 in.)</td>
<td>22 (0.034 in.)</td>
</tr>
<tr>
<td>29&quot; - 36&quot;</td>
<td>22 (0.034 in.)</td>
<td>20 (0.040 in.)</td>
<td>20 (0.040 in.)</td>
</tr>
<tr>
<td>37&quot; - 52&quot;</td>
<td>20 (0.040 in.)</td>
<td>18 (0.052 in.)</td>
<td>18 (0.052 in.)</td>
</tr>
</tbody>
</table>

G. When required, heavier ductwork shall be installed to meet the requirements of the UL Fire Resistance Index.

H. Where indicated on the drawings or where insufficient space is available for round ductwork, flat oval ductwork may be used. The conversion from round duct sizes to flat oval should be made on an equivalent pressure loss basis, not on an equal cross-sectional area. The flat oval ducts shall be constructed in accordance with current SMACNA standards.

I. Rectangular Duct Section Connections - Shall be as described in the SMACNA Standards. Contractor may use zero leakage four corner bolted companion angle transverse joint as manufactured by DUCTMATE INDUSTRIES, INC. or LOCKFORMER. Joint shall be constructed of galvanized steel with bolting corner pieces, roll formed double wall mating angles, gasketing, mastic sealer and snap-on flange cover cleats.

2.4 FLEXIBLE DUCTWORK

A. Where shown on the drawings provide flexible ductwork between branch ducts and terminals or air outlets. It shall be of a low or medium pressure to match duct system served.

B. Ductwork

1. Insulated flexible ductwork shall be factory pre-insulated duct composed of a
corrosion-resistant reinforcing wire or band helix permanently bonded and enclosed in polyester film, covered with 1 1/2", 3/4 pound density fiberglass insulation blanket sheathed in a vapor barrier of aluminum polyester film laminated to glass mesh, elastomer back coated. The flexible duct shall be rated for a minimum working velocity of 2000 fpm, shall be listed by Underwriters Laboratories under their UL-181 standards as a Class 1 air duct material and shall comply with NFPA standard No. 90A.

2. Taps for flexible ductwork shall be high efficiency gasketed air-tite type with manual damper.

C. The maximum length of flexible duct connection shall be ten feet.

D. Flexible ductwork shall not be used for return air or exhaust air ductwork.

2.5 DUCT ACCESS DOORS

A. Duct Access Doors shall be provided in both the low and medium pressure duct systems as shown on the contract drawings and as specified.

B. Access doors shall be constructed as shown in SMACNA standards for the appropriate pressure classification. Door shall be the same gauge and material as the duct. All access doors shall be hinged, except where a removable type is required.

C. The minimum size of all access doors shall be 20" x 14" except where the duct is less than 16", in which case one dimension shall be 20" and the other 2" less than the duct width.

D. Access doors shall be provided in the following locations: At the linkage side of automatic dampers; at the manual volume control dampers; at smoke detection heads; fire dampers; and any other service, balance or control device requiring periodic maintenance.

2.6 FLEXIBLE CONNECTIONS AT FAN

A. Flexible connections shall be provided at the inlet and outlet connection for each fan, between ductwork and inlet and outlet collars.

B. Each flexible connection shall be designed to allow one inch of free movement and shall be completely air tight and shall have sewed and cemented seams.

C. Flexible connections for low-pressure ductwork shall be in accordance with SMACNA standards. Material shall be neoprene coated glass fabric, 30 oz. per square yard.

D. Flexible connections for medium pressure ductwork shall be the same as for low pressure except additional reinforcing shall be provided as required by the operating pressure of the system.

E. Flexible connections to any roof mounted equipment shall not be exposed to the elements. Flexible connections shall be located inside the building just below the roofline. For side discharge units the flexible connection shall be located inside the building just inside the wall.
2.7 TURNING VANES

A. Any square elbow ductwork 18 inches or over in width shall require turning vanes of galvanized steel.

B. Vanes for Low and Medium Pressure Systems: Shall be as shown in SMACNA standards for appropriate pressure classification.

C. Vane lengths shall not exceed 36" for low-pressure systems or 48" for medium pressure systems. Where greater lengths are required, separate banked sections shall be provided.

2.8 FIRE, SMOKE AND CEILING DAMPERS.

A. Fire dampers, also known as flame retarding or primary dampers, may be of the individual folded blade type, the continuous folded stainless steel one piece curtain type, the pivoted single blade type or the pivoted multi-blade type, providing they bear a UL label for the complete assembly. Dampers shall be sized so that folded or open blades do not restrict the duct free area given by the duct dimensions. Dampers shall have a positive lock in the closed position. Fusible links shall be UL listed and marked 160°F.

B. Ceiling dampers, also known as radiation shielding or secondary dampers, may be of the single blade spring loaded guillotine type, the continuous folded stainless steel one piece curtain type or the folded approved fire retardant fabric type provided they bear a UL label for the complete assembly. Single protected pivoted blade type ceiling damper constructed in accordance with the requirements of specific UL ceiling assemblies and SMACNA standards and subject to field acceptance may be used where permitted by the conditions of the specific UL ceiling assembly used. Dampers shall be sized so that folded or open blades do not restrict the duct free area given by the duct dimensions. Dampers shall have a positive lock in the closed position. Fusible links shall be UL listed and marked 160°F.

C. Smoke dampers shall meet the requirements of NFPA 90A & 92A and UL5555. Smoke dampers shall be UL Class I smoke damper, normally open and automatically operated by a 120 volt, electric actuator. Provide airfoil style blades. Elevated temperature rating shall be 350°F. Smoke damper shall operate upon activation of smoke detector and re-settable by a locally mounted momentary contact switch.

D. All dampers shall be installed in sleeves a minimum of two gauges heavier than the connecting ductwork unless noted otherwise. Sleeves shall be mounted within and secured to wall, floor, ceiling or other structural penetration. Dampers shall be positioned only as permitted in the UL listing. Connecting ductwork shall be joined to the sleeve so that in the event of damage to the duct system it will break away leaving the fire damper and sleeve intact in the structural penetration. When necessary to avoid obstructions and after acceptance by the Architect, damper dimensions may be different from the connecting ductwork providing the required free area is maintained and 15° maximum transitions are used.

E. Provide UL listed, photoelectric, 120 volt smoke detector for use with smoke damper and 120 volt, reset switch, (normally on, momentary off) mounted within sight of the damper and detector. This switch shall reset the damper and the detector. Smoke detectors shall be rated for air velocities of 500 to 4000 fpm and have integral, auxiliary contacts for “ALARM” and...
“TROUBLE” annunciation to the fire alarm system.

2.9 MANUAL VOLUME CONTROL DAMPERS

Manual Volume Control Dampers in ducts not exceeding 12" on the longest side shall be as shown in SMACNA Duct Standards. For ducts over 12", dampers of the opposed multi-blade type shall be used. Dampers shall be galvanized steel, swivel end bearings at one end of the blade, and quadrant with level and lock-screw at the opposite end. Multi-blade dampers shall have steel washers at ends of damper rods with self-aligning blade interconnecting hardware.

2.10 COATED DUCT LINER

A. Duct Liner: Low-Pressure Ductwork

1. All plenums and transfer ducts shall receive duct liner. Supply air ductwork shall receive duct liner from the fan discharge to 20 feet downstream from the fan discharge or as otherwise shown. Return air duct work shall receive duct liner from the fan suction to 20 feet upstream from the fan suction or as otherwise shown. All supply air discharge ductwork from fan coil units shall receive duct liner.

2. Duct liner shall be designed for use as an acoustical and thermal insulation for sheet metal heating and cooling ducts and plenums. The duct liner shall have a density of 1.5 pounds per cubic foot a "K" factor not to exceed .24 @ 50°F mean temperature and a minimum NRC rating of .75. The minimum duct liner thickness shall be 1 inch.

3. Duct liner shall be designed for use as an acoustical and thermal insulation for sheet metal heating and cooling ducts and plenums. The duct liner shall have a density of 1.5 pounds per cubic foot a "K" factor not to exceed .24 @ 50°F mean temperature and a minimum NRC rating of .75. The minimum duct liner thickness shall be 1 inch.

4. Duct liner air stream surface shall be coated with an immobilized, EPA-registered antimicrobial agent so it will not support microbial growth. Duct liner shall be Johns Manville Linacoustic RC. Duct liners with similar characteristics will be considered as long as all aspects of the specifications are met.

B. Duct Liner: Medium Velocity

1. All rectangular supply/return air duct and all air duct outside exposed to weather shall receive duct liner. Rectangular supply air duct shall receive duct liner from the fan discharge to 20 feet downstream from the discharge or as otherwise shown. Return air duct work shall receive duct liner from the fan suction to 20 feet upstream from the fan suction or as otherwise shown.

2. Duct liner shall be designed for use as an acoustical and thermal insulation for sheet metal heating and cooling ducts. The duct liner shall have a density of 1.5 lbs./cu. ft., a "K" factor not to exceed .24 @ 50 degrees F mean temperature and a minimum NRC rating of .95. The minimum duct liner thickness shall be 2 inches.
3. Duct liner air stream surface shall be coated with an immobilized, EPA-registered antimicrobial agent so it will not support microbial growth. Duct liner shall be Johns Manville Linacoustic RC. Duct liners with similar characteristics will be considered as long as all aspects of the specifications are met.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. The ductwork, fittings, access doors, flexible connections, turning vanes, hangers and supports, fire dampers, volume dampers and other accessories shall be installed as recommended by SMACNA Duct Construction Standards. Ductwork shall not be supported from bottom chords of bar joists, bridging between bar joists or from metal decks. Ductwork shall be supported from the top chords of bar joists.

B. All necessary allowances and provisions shall be made by this contractor for beams, columns or other obstructions of the building or the work of other contractors, whether or not same is indicated. Where necessary to avoid obstructions, the ducts shall be transformed, divided or moved to one side with the required free area being maintained, all as approved or directed by the Architect.

C. Flexible ducts shall be secured to the metal ductwork, terminal units and supply diffusers by use of a 3/4” minimum width stainless steel drawband pulled tight with an adjusting worm drive type screw. Flexible duct insulation shall be properly sealed at connections to maintain vapor seal/barrier.

D. All duct dimensions shown on the drawings are inside clear dimensions. The duct sizes of ducts with duct liner shall be increased accordingly.

3.2 DUCT LINER

Duct Liner Application: Coated duct liner shall be cut to assure overlapped and compressed longitudinal corner joints. Apply liner with coated surface facing the air stream and adhere with 100% coverage of fire retardant adhesive. Coat all exposed leading edges and all transverse joints with fire retardant adhesive. The liner shall be additionally secured with mechanical fasteners which shall compress the duct liner sufficiently to hold it firmly in place as follows:

A. Low Velocity to 2000 FPM: Fasteners shall start within 3” of the upstream transverse edge of liner and 3” from the longitudinal joints and shall be spaced at a maximum of 12” o.c. around the perimeter of the duct, except that they may be a maximum of 12” from a corner break. Elsewhere they shall be a maximum of 18” o.c. except that they shall not be more than 6” from a longitudinal joint of liner nor 12” from a corner break. Coat all exposed joints with a fire retardant adhesive.

B. Medium Velocity from 2000 FPM to 4000 FPM - Fasteners shall start within 3” of the upstream transverse edges of the liner and 3” from the longitudinal joints shall be spaced at a maximum of 6” o.c. around the perimeter of the duct, except that they may be a maximum of 6” from a corner break. Elsewhere they shall be a maximum of 16” o.c. except that they shall not be more than 6” from a longitudinal joint of liner nor 12” from a corner break.
C. In addition to adhesive edge coating of transverse joints, any longitudinal joints shall be similarly coated with adhesive.

3.3 WATERPROOFING DUCTWORK ABOVE ROOF

A. Exposed ductwork shall be waterproofed with a prefabricated self-adhering, sheet-type waterproofing membrane as manufactured by Venture Tape and offered as VentureClad-1579CW series. Additional manufacturers will be considered providing all aspects of the specifications are met.

B. Materials:

1. Prefabricated, Self-Adhering, Sheet-Type Waterproofing Membrane.
   a. Description:
      1) Top Layer: Stucco-embossed, UV-resistant aluminum weathering surface.
      2) Middle Layer: Double layer of high-density polyethylene reinforcement.
      3) Bottom Layer: Uniform layer of rubberized asphalt adhesive, protected by disposable silicone release paper.
      4) Heat Aging, ASTM D 794: No visible blistering or deterioration.
      5) Tear Resistance, ASTM D 1424, Average: 660 grams.
      7) Low Temperature Flexibility, 1,000,000 Cycles at -10 Degrees F, 1,200 Cycles at 20 Degrees F: No cracking.
      8) Water Vapor Transmission, ASTM E 96: 0.009 perms.
      9) Flame Spread Index, ASTM E 84.0.
      10) Smoke Density Index, ASTM E 84.5.
      11) Wind-Driven Rain, SFBC TAS-110-95, 100 mph: No leakage or failure.
      12) UV Stability: Excellent.

C. Surface Preparation and Application

1. Prepare surfaces in accordance with manufacturer's instructions.

2. Ensure tops of ducts have sufficient slope to eliminate ponding water.
3. Remove dirt, dust, oil, grease, hand oils, processing lubricants, moisture, frost, and other contaminants that could adversely affect adhesion of waterproofing membrane. Ensure surfaces are clean and dry.

4. Apply membrane to clean, dry, primed metal ductwork and foil-faced rigid insulation boards. Do not apply over wet or non-rigid insulation.

5. Apply membrane in accordance with manufacturer's air, material, and surface temperature requirements.

6. Apply firm, uniform pressure with hand roller to entire membrane to ensure proper adhesion. Concentrate pressure at seams and on underside of ductwork.

7. Apply membrane to ducts in accordance with manufacturer's instructions.

8. Apply membrane shingle fashion to shed water over, not against laps.

9. Do not terminate membrane on bottom of duct.

10. Apply minimum 3-inch side laps and minimum 6-inch end laps for ductwork applications.

3.4 DUCT SEALING FOR VARIABLE AIR VOLUME SYSTEMS

A. All supply/return air metal and flexible duct joints shall be sealed with water based brush on duct sealant such as FLEX-GRIP 550 as manufactured by Hardcast, Inc. or UNI-FLEX as manufactured by McGill AirSeal LLC and applied in accordance with the manufacturer's directions.

B. Where zero leakage transverse joints as manufactured by DUCTMATE INDUSTRIES or LOCKFORMER are used to join rectangular duct sections additional sealing is not required at those joints unless leakage is revealed during pressure tests.

3.5 LEAKAGE

A. All low pressure supply, return and outside air ductwork shall be tested and made substantially airtight at static pressure indicated for the system before covering with insulation or concealing in masonry. Substantially airtight shall be construed to mean that no air leakage is noticeable through the senses of feeling or hearing at all duct joints. Supply, return and outside air transverse duct joints shall be sealed a water based brush on duct sealant such as FLEX-GRIP550 as manufactured by HARDCAST or UNI-FLEX as manufactured by McGill LLC.

B. The entire medium pressure ductwork system, including duct runouts to the variable air volume control units, shall be pressure tested for leakage at three (3) inches ductwork static pressure. Perform leakage tests in accordance with the SMACNA HVAC Duct Leakage Test Manual, using test forms equivalent to those outlined in manual. Tests shall be observed by the Architect, Engineer and owner's representative. A test log shall be maintained by the
contractor which will contain the results of systems tested and approval from test observer. Copies of the test log will be included in the operation and maintenance manuals.

3.6 CLEANING/STORAGE

Every effort should be made to ensure the components of the ductwork systems are kept clean and free of dust and debris. Stocked ductwork shall be stored in areas which are away from dust producing operations. Lined ductwork shall be stored in areas which are substantially weather-tight. Should any portion of lined ductwork become water saturated during storage or installation identified sections will be removed and replaced at no additional cost to the owner. As ductwork is being installed any open ductwork shall be temporarily sealed to prevent the ductwork from being contaminated with construction debris or dust. Temporary filter media shall be installed on the return systems of any equipment which is required to be run as a temporary control during the construction period. Temporary filters shall be monitored and changed frequently to ensure the cleanliness of the ducted systems.

After completing installation of ductwork, entire system shall be cleaned of rubbish, plaster, dirt and any other debris. After installation of equipment and connections are made on fan, and before any grilles are installed, entire system shall be blown out with dampers and outlets wide open.

3.7 DUCT SMOKE DETECTORS

Duct smoke detectors shall be furnished under and interconnected between the auxiliary contacts and the fire alarm system by the Division 26 contractor and installed under this section. The duct smoke detectors shall be installed in accordance with the manufacturer's recommendations, NFPA requirements and local fire marshal requirements. Duct smoke detectors shall be mounted to allow full access for service.

3.8 FIRE, SMOKE AND CEILING DAMPERS

A. Provide fire dampers where ducts pass through fire-rated components and where required by the local authority. Install in accordance with local codes, NFPA, SMACNA-FSR and manufacturers requirements.

B. Demonstrate the re-setting of the smoke damper and smoke detector to the Fire Marshal and the owner’s representative.

C. All interlock wiring between the 120 volt power supply and devices listed in this section shall be installed under this section. All wiring shall conform to the requirements of Division 26.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL

The Bidding and Contract Requirements, Division 01 - General Requirements, Section 23 05 01 - General Provisions, and Section 23 05 00 - Common Work Results for HVAC shall apply to this section.

1.2 SCOPE

Provide and install the Cabinet and Ceiling Exhaust Fans as shown on the drawings and specified herein.

1.3 QUALITY ASSURANCE

Exhaust fan shall have Certified Rating Seal by AMCA and shall be UL listed.

1.4 SUBMITTALS

Provide shop drawings on this equipment as described in Section 23 05 01.

PART 2 - PRODUCTS

2.1 CABINET AND CEILING EXHAUST FANS

The exhaust fan shall consist of a centrifugal type fan with a direct drive motor. Fan shall be of the low sound level type. Motor speed shall not exceed 1100 rpm. The manufacturer shall be PENN VENTILATOR COMPANY. Fans fully equal to the specified manufacturer by GREENHECK, ACME, JENCOFAN, CARNES, US FAN or LOREN COOK are acceptable.

2.2 HOUSING

Shall be acoustically insulated and shall be provided with a backdraft damper, motor vibration isolation and electrical connections. Factory air inlet grille shall be provided on ceiling exhaust fans. Cabinet fans shall be arranged for inline duct mounting.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The exhaust fans shall be installed as recommended by the manufacturer and as shown on the drawings.
B. Fans shall be controlled as outlined in the Automatic Temperature Control section.

END OF SECTION
PART 1 - GENERAL

1.1. SUMMARY

A. Section Includes: HVAC Power Ventilators

B. Related Sections:

1. 01 00 00 General Requirements
2. 23 05 00 Common Work Results for HVAC
3. 23 05 01 General Provisions
4. 23 05 93 Testing, Adjusting and Balancing of Systems

1.2. REFERENCES

A. Air Movement and Control Association Inc. (AMCA):

1. 99 - Standards Handbook
2. 200 - Publication, Air Systems
3. 201-90 - Publication, Fans and Systems
4. 202-88 - Publication, Troubleshooting
5. 203-90 - Publication, Field Performance Measurement of Fan Systems
7. 300-96 - Standard Reverberant Room Method for Sound Testing of Fans
8. 311-05 - Publication, Certified Ratings Program - Product Rating Manual for Fan Sound Performance
9. 99-0401-86 - Classification for Spark Resistant Construction

10. 99-2408-69 - Operating Limits for Centrifugal Fans

B. Air Movement and Control Association Inc. (AMCA), American National Standards Institute (ANSI):

1. 204-05 - Standards Balance Quality and Vibration Levels for Fans

2. 210-99 - Standard Laboratory Methods of Testing Fans for Aerodynamic Performance Rating

C. American National Standards Institute (ANSI):

1. 11-r1999 - Method of Evaluating Load Ratings of Bearings

D. American Society of Civil Engineers (ASCE):

1. 7-02 - Minimum Design Loads for Building and Other Structures

E. American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE):

1. Chapter 45 - 2003 Handbook, HVAC Applications

2. Chapter 7 - 2001 Fundamentals handbook, Sound-Vibration

3. Chapter 32 - 2001 Fundamentals handbook, Duct Design


F. American Society for Testing and Materials (ASTM):


G. National Fire Protection Association (NFPA):

1. 70 - National Electrical Code

2. 90A-02 - Standard for the Installation of Air-Conditioning and Ventilating Systems

3. 92A-06 - Recommend Practice for Smoke-Control System

4. 92B-05 - Standard for Smoke Management System in Malls, Atria, and Large Areas
5. 96-04 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations

H. Occupational Safety and Health Administration (OSHA):

1. 1910.212 - General requirements for Machine Guarding

2. 1910.219 - General requirements for guarding safe use of mechanical power transmission apparatus

3. 1926.300 - General requirements for safe operation and maintenance of hand and power tools

I. Underwriters Laboratories (UL):

1. 507 - Electric Fans

2. 555 - Fire Dampers

3. 555S - Smoke Dampers

4. 705 - Standard Power Ventilators

5. 762 - Standard Power Roof Ventilators for Restaurant Exhaust Appliances

6. 793 - Snow Load

1.3. SUBMITTALS

A. General: Submit in accordance with Section 23 05 01 Submittal Procedures

B. Provide dimensional drawings and product data on each fan

C. Provide fan curves for each fan at the specified operation point, with the flow, static pressure, and horsepower clearly plotted

D. Provide outlet velocity and fan's inlet sound power readings for the eight octave bands, decibels, and sones

E. Strictly adhere to QUALITY ASSURANCE requirements as stated in section 1.04 of this specification

F. Provide manufacturer's certification that exhaust fans are licensed to bear Air Movement and Control Association (AMCA), Certified Rating Seal for sound and air performance
G. Installation, Operation, and Maintenance Manual (IOM): Provide manufacturer's installation, operations, and maintenance manual, including instructions on installation, operations, maintenance, pulley adjustment, receiving, handling, storage, safety information and cleaning. A troubleshooting guide, parts list, warranty, and electrical wiring diagrams

1.4. QUALITY ASSURANCE

A. Power roof ventilators shall have Certified Rating Seal by AMCA or published data by an acceptable manufacturer and shall be UL listed.

1.5. DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer’s original, unopened containers and packaging, with labels clearly indicating manufacturer, material, products included, and location of installation

B. Storage: Store materials in a dry area indoor, protected from damage, and in accordance with manufacturer’s instructions. For long term storage follow manufacturer's Installation, Operations, and Maintenance Manual

C. Handling: Handle and lift fans in accordance with the manufacturer’s instructions. Protect materials and finishes during handling and installation to prevent damage. Follow all safety warnings posted by the manufacturer

1.6. MAINTENANCE

A. Refer to Manufacturer's Installation, Operation and Maintenance Manual (IOM), to find maintenance procedures

PART 2 - PRODUCTS

2.1. MANUFACTURER

A. The power roof ventilator shall be the type, capacity and drive (belt drive or direct drive), and be located as shown on the drawings. Power roof ventilator shall be manufactured by GREENHECK. Ventilators fully equal to the specified manufacturer and manufactured by CARNES, JENCOFAN, ACME, US FAN OR LOREN COOK are acceptable.

2.2. DIRECT DRIVE ROOF UPBLAST CENTRIFUGAL EXHAUST FANS

A. General Description:

1. Discharge air directly away from the mounting surface.
2. Each fan shall bear a permanently affixed manufacture's engraved metal nameplate containing the model number and individual serial number.

B. Fan: Shall be provided with a backward inclined centrifugal wheel that has been statically and dynamically balanced. The bearings shall be heavy duty, self-aligning, sealed ball bearings. The motor and fan assembly shall be isolated from the base with rubber-in-shear vibration isolators.

C. Belt drive ventilators shall have variable speed sheave pulley to adjust the speed of the ventilator.

D. Motor: Shall be installed in a totally enclosed weatherproof housing outside of the air stream. The motor shall have sealed ball bearings and be internally thermally protected.

E. Disconnect Switch: A factory wired non-fused toggle type disconnect switch shall be located under the housing of the unit.

F. Starter: Provide a magnetic across-the-line starter for three phase units. The starter shall have ON-OFF-AUTO switch and red running light. See section 23 05 00 2.6.

G. Pre-fabricated aluminum or galvanized steel curbs 12” high shall be provided to match the power roof ventilator. The curb shall be flashed to match the roofing system. Provide wood nailer. The power roof ventilator and curb shall be provided by the same manufacturer. Backdraft dampers shall be mounted in the curb and shall be full size of the opening.

H. Accessories shall be provided as shown on the drawings. Such accessories shall be of the same manufacturer as the ventilators. All ventilators shall have gravity type backdraft dampers.

PART 3 - EXECUTION

3.1. MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including technical bulletins, product catalog installation instructions.

3.2. EXAMINATION

A. Examine areas to receive fans. Notify the Engineer of conditions that would adversely affect installation or subsequent utilization and maintenance of fans. Do not proceed with installation until unsatisfactory conditions are corrected.

3.3. PREPARATION

A. Ensure roof openings are square, accurately aligned, correctly located, and in tolerance.
B. Ensure duct is plumb, sized correctly, and to proper elevation above roof deck. Install duct as specified in Air Distribution (Division 23)

3.4. INSTALLATION

A. Install fans system as indicated on the Installation, Operation and Maintenance Manual (IOM) and contract drawings

B. Install fans in accordance with manufacturer's instructions

3.5. SYSTEM STARTUP

A. Refer to Installation, Operation, and Maintenance Manual (IOM)

3.6. CLEANING

A. Clean as recommended by manufacturer. Do not use material or methods which may damage finish surface or surrounding construction

3.7. PROTECTION

A. Protect installed product and finished surfaces from damage during construction

B. Protect installed exhaust fans to ensure that, except for normal weathering, fans will be without damage or deterioration at time of substantial completion

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL

The Bidding and Contract Requirements, Division 01 - General Requirements, Section 23 05 01 - General Provisions and Section 23 05 00 - Common Work Results for HVAC shall apply to this section.

1.2 SCOPE

The work covered under this section shall include various types of air outlets and inlets to be furnished and installed complete.

1.3 QUALITY ASSURANCE

Air outlets and inlets shall be rated by a recognized testing agency such as the Air Diffusion Council, ASHRAE Standard 36-72, Air Movement and Control Association International, Inc., or an acceptable manufacturer's test laboratory.

1.4 SUBMITTALS

Provide shop drawings on this equipment as described in Section 23 05 01. Shop drawings shall include proposed uses of all items.

PART 2 - PRODUCTS

2.1 GRILLES, REGISTERS AND CEILING DIFFUSERS

The grilles, registers and ceiling diffusers shall be provided as shown on the drawings along with accessories as required. The grilles, registers and ceiling diffusers shall be manufactured by CARNES, KRUEGER, TITUS, TUTTLE and BAILEY, NAILOR, PRICE or METALAIRE unless otherwise noted, provided the items are fully equal to the item specified below.

A. Supply Air Diffuser, Ceiling, Square: lay-in type, steel, stamped type, fixed pattern, square louvered face, opposed blade volume damper, equalizing grid, (combination damper/grid are not acceptable) white powder coat finish. Price model SCD.


C. Supply Air Registers: Steel adjustable vanes, double deflection, vertical front vanes, opposed blade dampers, Aluminum finish. Price model 520D.

E. Return Air Grille, Ceiling: Steel individual fixed horizontal face bars, 0° deflection, white finish, size shall be minimum 12” x 24”. Price model 510HZ.

F. Return Air Grille, Wall: Steel, individual fixed horizontal face bars, 40° deflection, heavy duty type, aluminum finish. Price model 91.

G. Return Air Register, Ceiling: Steel, individual fixed horizontal face bars, 0° deflection, volume damper, white enamel finish. Price model 510ZD. Exhaust air register shall be the same except aluminum, Price model 610ZD.

H. Linear Slot Diffuser: Aluminum, adjustable blades, 1” slot with 1” frame, standard frame finish white, mounting hardware, 1” end caps at both ends, blank sections as required. Remove blades when used as a return. Coordinate with drawings for frame type, number of slots and length. Price model SDS100 Frame 2.

2.2 ROOF VENTS - RELIEF OR INTAKE

A. Roof vents shall have the following features:
   1. Aluminum hood panels.
   2. 12” high curb.
   3. Aluminum bird screen.
   5. Motorized damper.

B. Prototype: GREENHECK model Fabra.

2.3 LOUVERS

Louvers shall be furnished under Division 23 unless specified under the architectural sections.

Stationary Louvers: Shall be extruded aluminum, 4” blade spacing, 45° blades with rain hook and continuous underside reinforcing bosses. Provide boxed frame for mounting inside masonry openings and flanged frame for panel wall openings. Provide duct collar, 1/2” mesh aluminum bird screen and clear anodized finish; color selection shall be approved by Architect. Louver shall meet AMCA test standards for pressure drop and water leakage. Prototype - ARROW model EA-405-FF. Louvers fully equal to the specified manufacturer and manufactured by AIRSTREAM, RUSKIN, AIRLINE, AIR BALANCE or CARNES will be acceptable.

2.4 MOTORIZED DAMPERS

Motorized dampers shall be low leakage opposed blade galvanized steel type with 16 gauge frame and...
16 gauge blades. Maximum blade width 8". Provide neoprene seals at all blade edge and side meeting surfaces so that air leakage shall be no more than 1% at 4" static pressure. Provide Teflon or oil impregnated bronze shaft bearings and standard finish. Prototype: ARROW model 395. MotORIZED dampers fully equal to damper specified and manufactured by RUSKIN, AIR BALANCE, PENN VENTILATOR, CESCO, DOWCO or CARNES will be acceptable.

2.5 VARIABLE AIR VOLUME CONSTANT VOLUME TERMINAL UNIT

A. Provide and install fan powered terminals with electrically driven fan and automatically controlled modulating damper. Unit shall supply a constant volume of air to the space by mixing of the primary conditioned variable air with ceiling plenum return air as described herein and shown on the drawings. Capacities shall be as shown in the equipment schedule.

B. Air Controlling Assembly - Shall consist of volume regulator, air flow throttling control device, device operator, and adjustment points. Regulator shall compensate for static pressure fluctuations by repositioning damper operator and shall act as reversing relay. Provide normally closed actuators for units with integral heating coils.

C. Cabinet shall be galvanized steel wrap around one-piece structural frame with all exposed edges flanged and interior of discharge section insulated. Mixing section shall have single blade gasketed minimum leakage damper. Fans shall be centrifugal forward curved double width mounted on double-shafted three-speed permanent split capacitor motor. Fan wheels and housing shall be constructed of noncorrosive material.

D. Coils - Shall be constructed of aluminum fins mechanically bonded to seamless copper tubes, with continuous fin collars and sleeved coil and supports. Coils shall be factory leak tested at a minimum 300 psi.

E. Unit Supports - Control units and slot type diffusers shall be located as shown on drawings and shall be independently supported with mounted channel and SMACNA approved hanger strap.

F. Filters - Shall be throwaway type.

G. The Sound Power Levels (10 - 12 watts) generated when producing the specified cfm shall not exceed the following figures in any octave band.

<table>
<thead>
<tr>
<th>Octave Band</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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<tbody>
<tr>
<td>Center Frequency</td>
<td>125</td>
<td>250</td>
<td>500</td>
<td>1000</td>
<td>2000</td>
<td>4000</td>
<td>8000</td>
</tr>
<tr>
<td>Sound Power Level</td>
<td>73</td>
<td>69</td>
<td>66</td>
<td>59</td>
<td>54</td>
<td>53</td>
<td>56</td>
</tr>
</tbody>
</table>

H. Fan and damper controls shall be furnished and installed under the Automatic Temperature Control section of the specification. The division 25 contractor shall furnish and ship direct digital controllers to the terminal equipment manufacturer for factory installation. The division 25 contractor shall provide the equipment manufacturer with the necessary wiring diagrams and mounting instructions. The terminal equipment manufacturer shall furnish transformers, relays, airflow sensors and enclosures.
I. Manufacturer – PRICE or acceptable by ENVIRONMENTAL TECHNOLOGIES, CARRIER, TITUS, TRANE, or TEMPMASTER.

2.6 VARIABLE AIR VOLUME (VAV) EQUIPMENT TERMINAL UNITS

A. Provide shutoff type air terminal components of an automatically controlled variable air volume system as described herein and shown on the drawings. The system shall consist of air modulating control units serving remote diffusers. Capacities shall be as shown in the equipment schedule.

B. VAV box manufacturer shall provide all necessary transformers, relays, airflow rings and enclosures. The division 25 contractor shall furnish and ship the direct digital controllers and actuators to the equipment manufacturer for installation. The division 25 contractor shall provide the equipment manufacturer with the necessary wiring diagrams and mounting instructions.

C. Air Control Units- Shall regulate the air volume delivered to diffusers either mounted on the unit or remotely connected by ductwork. Units shall be constructed of heavy gauge galvanized steel. All interior surfaces shall be acoustically and thermally insulated with glass fiber material, surface treated to prevent erosion. Insulation shall be U/L listed and meet NFPA requirements. Provide hanger holes at all four corners. Minimum box setting shall be factory adjusted to minimum airflow shown in the equipment schedule.

D. Automatic Temperature Control System- Damper operator shall be controlled by a remote sensor as described in the temperature control section of the specifications.

E. Air Controlling Assembly- Shall consist of volume regulator, airflow throttling control device, device operator, and adjustment points. Regulator shall compensate for static pressure fluctuations by repositioning damper operator and shall act as a reversing relay. Provide normally open direct acting actuator or provide the necessary reversing relay to meet this requirement.

F. Hot Water Coil- Shall be constructed of aluminum fins mechanically bonded to seamless copper tubes, with continuous fin collars and sleeved coil and supports. Coil shall be factory leak tested at minimum 300 psi.

G. Manufacturer- PRICE or acceptable by ENVIRONMENTAL TECHNOLOGIES, CARRIER, TITUS, TRANE or TEMPMASTER.

2.7 THERMALLY POWERED VAV DIFFUSER

A. Thermally powered VAV diffuser shall be a complete VAV terminal and thermostat self contained in a 24 inch square diffuser. They shall be thermally powered with one room thermostat / actuator and one changeover thermostat / actuator.
B. The VAV diffusers shall have a thumbwheel and temperature scale to adjust the cooling setpoint and another thumbwheel and temperature scale for the heating setpoint. The adjustment shall be above the hinge down panel. Each setpoint shall be separately adjustable between 70°F and 78°F.

C. In the cooling mode, the VAV diffuser shall open on a rise in room temperature and in the heating mode; it shall close on a rise in room temperature. The changeover thermostat shall be factory installed and adjusted to engage the heating mode when the supply air temperature rises above 80°F and return to cooling mode when the supply air temperature falls below 68°F. During the changeover, the diffuser shall close, or if a minimum flow is set, go to the minimum.

D. All VAV diffusers shall have a dial and scale to adjust minimum flow between 5 CFM and 50% of maximum flow without tools. Minimum flow shall be factory set at 10%. A fixed maximum flow stop shall be factory set for the fully open air flow of the specified inlet size.

E. All VAV diffusers shall have a lever which will open the damper for balancing without tools. The balancing lever shall be accessible from the outside of the diffuser without folding down the appearance panel or removing any part of the diffuser.

F. Acceptable manufacturers – ACCUTHERM “Thermafuser”, PRICE “Varitherm”, or THERMAL PRODUCTS “Variflow”.

PART 3 - EXECUTION

3.1 GRILLES, REGISTERS, DIFFUSERS, AND LOUVERS - INSTALLATION

A. The grilles, registers and ceiling diffusers shall be installed in accordance with the manufacturer's recommendations. Dampers shall be installed where shown and where required to balance the air system.

B. Before locating grilles and ceiling diffusers, check the Architectural and Electrical drawings to make sure that there is no conflict with floor moldings, electrical outlets, lighting fixtures or any other obstruction. Low sidewall grilles and registers shall be mounted with the bottom edge eight inches above the floor with the vanes turned down. High sidewall grilles and registers shall be mounted six inches below the ceiling or as shown on architectural drawings.

C. Air extractors shall be provided and installed as shown on the drawings. Provisions shall be made to adjust air extractor from the exterior of the ductwork. When air extractor is installed, no damper for the register is required.

3.2 LOUVERS

Supply air, exhaust air and combustion air louvers shall be installed as shown on the drawings. The louvers shall be furnished under Division 23 unless specified under the architectural section. The
louvers shall be provided with 1/2" aluminum bird screen, duct collars where required, and be installed in a manner where no water will enter the building.

3.3 TERMINAL UNIT

A. Shall be installed in accordance with the manufacturers’ recommendations. For the Variable Air Volume Terminal Units, the first unit installed will be considered the typical mock up and shall require notification, inspection and approval by designated owner representative and/or architect and engineer before any additional installations will be allowed.

B. Filters - Shall be changed at the end of the construction period and before the final inspection. Provide a typed list of all the different units and their filter sizes to be included in the O & M manuals. The list shall include the unit designation, filter size and the number of filters required for each unit. In addition to this, submit to the Owner two additional copies of the list.

END OF SECTION
PART I - GENERAL

1.01 GENERAL

A. The Bidding and Contract Requirements, Division 1 - General Requirements, Section 23 05 01 - General Provisions, and Section 23 05 00 Common Work Results for HVAC shall apply to this section.

1.02 SCOPE

A. Provide and install complete the Combination Fancoil/Remote Heat Pump Units as shown on the drawing and specified herein.

1.03 QUALITY ASSURANCE

A. The combined systems shall comply with ARI Standard 210.

B. Both the fancoil unit and the heat pump unit shall be Underwriters Laboratories listed and bear the UL label.

1.04 SUBMITTALS

A. Provide shop drawings on this equipment as described in Section 23 05 01.

1.05 WARRANTY

A. The units shall have a manufacturer’s parts and defects warranty for a period five (5) years from date of installation. The compressor shall have an extended warranty of five (5) years from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty will not include labor.

PART 2 - PRODUCTS

2.01 COMBINATION FANCOIL/HEAT PUMP UNIT

The combination fan coil/heat pump unit systems shall be provided and installed of the type and capacities as shown on the drawings and specified herein. The matching systems shall be manufactured by the manufacturer shown on the drawings. Combination systems fully equal to the specified manufacturer and manufactured by MITSUBISHI ELECTRIC, CARRIER or DAIKIN are acceptable.
A. Ceiling Recessed Indoor Units

1. General: Shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

2. Unit Cabinet:
   a. The cabinet shall fit within a standard 24” square suspended ceiling grid.
   b. The cabinet panel shall have provisions for a field installed filtered outside air intake.
   c. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.

3. Fan:
   a. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
   b. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
   c. The indoor fan shall consist of three (3) speeds, Low, Mid, and High.
   d. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
   e. The auto air swing vanes shall be capable of automatically swinging up and down for uniform air distribution.

4. Filter:
   a. Return air shall be filtered by means of a long-life washable filter.

5. Coil:
   a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
   b. The tubing shall have inner grooves for high efficiency heat exchange.
   c. All tube joints shall be brazed with phos-copper or silver alloy.
   d. The coils shall be pressure tested at the factory.
A condensate pan and drain shall be provided under the coil.

The unit shall include a condensate lift mechanism that will be able to raise drain water 19-3/4” inches above the condensate pan.

An optional drain pan level switch (DPLS1), designed to connect to the control board, shall be provided if required, and installed on the condensate pan to prevent condensate from overflowing.

Both refrigerant lines to the SLZ indoor units shall be insulated.

6. Electrical:
   a. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.

7. Controls:
   a. The control system shall consist of a minimum of one microprocessor on each indoor unit and one on the outdoor unit, interconnected by single non-polar two-wire cables. The microprocessor located in the indoor unit shall have the capability of monitoring return air temperature and indoor coil temperature, receiving and processing commands from a wireless or wired controller, providing emergency operation and controlling the outdoor unit.

   b. The system shall be capable of automatic restart when power is restored after power interruption. The system shall have self-diagnostics ability, including total hours of compressor run time. Diagnostics codes for indoor and outdoor units shall be displayed on the wired controller panel.

8. Wired Remote Controller
   a. The Wired Remote Controller shall be approximately 5” x 5” in size and white in color with a light-green LCD display. The controller shall support a selection from multiple languages (Spanish, German, Japanese, Chinese, English, Russian, Italian, or French) for display information. There shall be a built-in weekly timer with up to 8 pattern settings per day. The controller shall consist of an On/Off button, Increase/Decrease Set Temperature buttons, a Cool/Auto/Fan/Dry mode selector, a Timer Menu button, a Timer On/Off button, Set Time buttons, a Fan Speed selector, a Ventilation button, a Test Run button, and a Check Mode button. The controller shall have a built-in temperature sensor. Temperature shall be displayed in either Fahrenheit (°F) or Celsius (°C), and Temperature changes shall be by increments of 1°F (0.5°C). The controller shall have the capability of controlling up to a maximum of 16 systems, as a group with the same mode and set-point for all, at a maximum developed control cable distance of 1,500 feet (500 meters).

   b. Field wiring shall run directly from the indoor unit to the wired controller with no splices. The control voltage from the wired controller to the indoor unit shall be 12/24 volts, DC. Up to two wired controllers shall be able to be used to control one unit.
9. The microprocessor located in the indoor unit shall have the capability of sensing return air temperature and indoor coil temperature, receiving and processing commands from the wireless or a wired controller, providing emergency operation and controlling the outdoor unit.

10. Indoor units shall be equipped with an optional “i-see® Sensor” kit, providing i-See® Sensor technology providing uniform temperature detection and automatically response to adjust the set temperature to provide uniform comfort from floor to ceiling.

11. Starter - Provided magnetic starter with red running light. See Electric Motor Starters, Section 23 05 00 - 3.7.

B. Outdoor Unit Cabinet:

1. The casing shall be fabricated of galvanized steel, Bonderized, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection. Assembly hardware shall be cadmium plated for weather resistance.

2. Assembly shall withstand lateral wind gust up to 155 MPH to meet applicable weather codes.

3. Fan:
   a. The unit shall be furnished with a direct drive, high performance propeller type fan.
   b. The condenser fan motor shall be a variable speed, direct current (DC) motor and shall have permanently lubricated bearings.
   c. Fan speed shall be switch automatically according to the number of operating indoor units and the compressor operating frequency.
   d. The fan motor shall be mounted with vibration isolation for quiet operation.
   e. The fan shall be provided with a raised guard to prevent contact with moving parts.
   f. The outdoor unit shall have horizontal discharge airflow.

4. Coil:
   a. The outdoor unit coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
   b. The coil shall be protected with an integral guard.
   c. Refrigerant flow from the outdoor unit to the indoor units shall be independently controlled by means of individual electronic linear expansion valves for each indoor unit.
d. Outdoor unit shall be pre-charged with sufficient R-410a refrigerant for up to one hundred and thirty-one (131) feet of refrigerant piping.

e. All refrigerant lines between outdoor and indoor units shall be of annealed, refrigeration grade copper tubing, ARC Type, meeting ASTM B280 requirements, individually insulated in twin-tube, flexible, closed-cell, CFC-free (ozone depletion potential of zero), elastomeric material for the insulation of refrigerant pipes and tubes with thermal conductivity equal to or better than 0.27 BTU-inch/hour per Sq Ft / °F, a water vapor transmission equal to or better than 0.08 Perm-inch and superior fire ratings such that insulation will not contribute significantly to fire and up to 1" thick insulation shall have a Flame-Spread Index of less than 25 and a Smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102.

f. All refrigerant connections between outdoor and indoor units shall be flare type.

5. Compressor:

a. The compressor shall be a high performance, hermetic, inverter driven, variable speed, dual rotary type.

b. The compressor motor shall be direct current (DC) type equipped with a factory supplied and installed inverter drive package.

c. The outdoor unit shall be equipped with a suction side refrigerant accumulator.

d. The compressor will be equipped with an internal thermal overload.

e. The compressor shall be mounted to avoid the transmission of vibration.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The combination system shall be installed and tested in accordance with the manufacturer's recommendations, start-up and service instructions and as shown on the drawings.

B. The refrigeration piping system shall be installed in accordance with section 23 23 00.

END OF SECTION
SECTION 26 05 00

GENERAL PROVISIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. It is the intent of this Specification that this Contractor furnish and install all material, labor, equipment, apparatus, tools, transportation, and other incidentals required to provide additions to the following: power distribution (both normal and stand-by emergency power); branch circuit wiring; low voltage wiring; wiring devices; grounding; lighting; lighting control systems; fire detection and alarm system; security intrusion system; door video access entry system; sound and intercommunications system and program system; telecommunications system as shown on Drawings and as described in these Specifications.

1.2 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

B. Provisions of this Section apply to each and every Section of this Division.

1.3 SCOPE

A. It is the intention of these Specifications and the Contract Drawings to call for finished work, tested and ready for operation.

B. Any apparatus, appliances, materials, or work not indicated but mentioned in these Specifications, or vice versa, or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished, delivered, and installed by this Contractor at no additional expense to the Owner.

C. Minor details not usually shown or specified, but necessary for the proper installation and operation shall be included the same as if herein specified or shown on the Drawings.

D. With submission of bid, this Contractor shall give written notice to the Architect/Engineer of any materials or apparatus believed: inadequate or unsuitable; in violation of federal, state, and local laws, codes, and ordinances, including Alexandria's electrical inspection rules or regulations; and any necessary items of the work which have been omitted. In the absence of such written notice, it shall be mutually agreed that the Contractor has included the cost of all required items in the proposal and that the Contractor shall be responsible for the approved satisfactory functioning of the entire electrical system and low voltage electrical systems at no additional expense to the Owner.
1.4 APPLICABLE SPECIFICATIONS, CODES, STANDARDS, AND PERMITS

A. Materials, equipment, and installation shall be in accordance with the requirements of the latest adopted editions of the National Electrical Code (NEC), the Virginia Uniform Statewide Building Code, and these Specifications.

B. Unless otherwise specified herein the work and material shall conform to the applicable requirements of the (latest editions or currently adopted) following codes, standards, and regulations:

3. Canadian Standards Association (CSA).
4. Electronic Industries Association / Telecommunications Industry Association (EIA/TIA)
5. Alexandria Fire Marshal’s Office.
8. International Code Council (ICC)
10. National Electrical Contractor’s Association (NECA).
11. National Electrical Manufacturer’s Association (NEMA).
13. Occupational Safety and Health Association (OSHA).
15. Virginia Occupational Safety and Health Program (VOSH).

C. All electrical materials and equipment shall be new, listed by UL, and bear the UL label. This applies to all equipment for which UL standards have been established and label service is regularly furnished.

D. Equipment not UL (or other testing agencies recognized by VUSBC) labeled and equipment assembled in the field using UL components and not UL labeled as an "assembly", for which standards have not been promulgated, shall be accepted upon
certification by A.B.M Electrical Power Solutions (MET ELECTRICAL TESTING), 4390 Parliament Place, Suite Q, Lanham, MD 20706 telephone: 240-487-1900 or ELECTRICAL TESTING CORPORATION, 1701 Edmondson Avenue, #201, Baltimore, Maryland, 21228, telephone 410-526-4700. Cost of such certification shall be included in the base bid and in each quoted cost for alternates and proposed change orders. Electrical equipment that requires certification shall be tested by this Contractor at no additional cost to the Owner.

E. Workmanship shall conform to the "Standard of Installation" published by the NECA. This Contractor shall provide a minimum of one (1) licensed journeyman electrician for each three (3) electrical workers assigned to this project. Such certification shall be provided to the Architect/Engineer upon request.

F. This Contractor shall: give all necessary notices; obtain all permits (including a low voltage wiring permit); pay all government taxes, fees, and other costs including, but not limited to the Alexandria Fire Marshal’s Office shop drawing review fees; file all necessary plans; prepare all documents; and obtain required certificates of inspection for work and deliver same to the Architect/Engineer before any request for acceptance and final payment for the work.

G. This Contractor shall be responsible for purchasing equipment and appliances that bear the label of an agency as approved by the Alexandria Department of Public Works and Environmental Services (DPWES). It shall be the responsibility of the Contractor to pay for any label testing of equipment or appliances that are installed without the label of a DPWES approved agency.

1.5 REVIEWS AND SHOP DRAWINGS

A. The materials, workmanship, design, and arrangement of all work installed under this contract shall be subject to the review of the Architect/Engineer and Owner.

B. Where any specified materials, process, or method of construction or manufactured article is specified by name, or by reference to the catalog number of a manufacturer, the specifications are to be used as a guide and are not intended to take precedence over the basic duty and performance specified or noted on the Drawings.

C. In all cases, the Contractor shall verify the duty and available electric characteristics with the specific characteristics of the equipment offered for review.

D. All component parts of each item of equipment or device shall bear the manufacturer's name plate giving name of manufacturer, description, size, type, serial or model number, electrical characteristics, etc., in order to facilitate maintenance or replacement. The nameplate of a Contractor will not be acceptable.

E. If materials or equipment are installed before they have been reviewed by the Architect/Engineer, the Contractor shall be liable for their removal and replacement at no additional expense to the Owner, if in the opinion of the Architect/Engineer, material or equipment does not meet the intent of the Drawings and Specifications.
F. This Contractor shall call to the attention of the Architect/Engineer by letter or on shop drawing submittals, any instance in which the shop drawings differ from the requirements of the Drawings and Specifications.

G. Data and shop drawings shall be coordinated and included in a single submission in a bound format. Multiple submissions are not acceptable except where prior approval has been obtained from the Architect/Engineer. In such cases, a list of data to be submitted later shall be included with the first submission. No delays in construction occasioned by the Contractor's failure to submit material in accordance with the approval schedule will be excused.

H. Catalogs, pamphlets, or other documents submitted to describe items on which review is being requested shall be specific and identifications in catalog, pamphlets, etc., of items submitted shall be clearly made in a contrasting ink. Data of a general nature shall not be acceptable.

I. Submitted samples, drawings, specifications, catalogs, and the like shall be properly labeled and shall indicate: specified service for which the material or equipment is to be used; Section and Article number of Specifications governing; contractor's name; and name of the job.

J. Data and shop drawings shall be identified in accordance with SECTION 01340. In addition, shop drawings shall be identified by the name of the item and system and the applicable Specification paragraph number. This Contractor shall submit the following components/systems described herein and as specified in other Sections of this Specification.

1. Boxes including device, junction, outlet, and pull types.
2. Cable hook (J-hook) support systems.
3. Conduit and associated fittings.
4. Disconnect /safety switches.
5. Grounding system, connectors, and welds.
6. Lighting control systems.
7. Lighting fixtures including lamps, ballasts, and poles.
8. Lighting occupancy sensors.
9. Panelboards, including distribution and branch circuit.
10. Rooftop conduit support system.
11. Surface metal raceways and fittings.
13. Wires, cables, and connectors.


K. No item or system listed in the schedule above shall be delivered to the site or installed until successful completion of the review. After review of the proposed materials has been successfully completed, no substitution shall be permitted except where approved by the Architect/Engineer in writing. Should the Contractor fail to comply with the requirements of this paragraph, the Owner reserves the right to select any and all items and systems required by this Specification. Materials so selected shall be used in the work at no additional expense to the Owner.

L. The successful review rendered on shop drawings shall not be considered as a guarantee of building conditions. Where shop drawings have been successfully reviewed, said review does not mean that the drawings have been checked in detail and does not in any way relieve the Contractor from the responsibility, nor the necessity of furnishing the material or performing the work as required by the Drawings and Specifications.

M. Failure to submit shop drawings that meet the requirements of the Drawings and Specifications in ample time for review shall not entitle the Contractor to an extension of contract time, and no claim for extension by reason of such default shall be allowed.

N. All equipment and materials to be furnished under this Division of these Specifications shall be as manufactured by the manufacturer(s) listed on the Drawings or herein specified. All requests by any bidder to provide equipment and/or material manufactured by a manufacturer not listed on the Drawings or specified herein, including equipment identified as “OR EQUAL” to a listed manufacturer, must be submitted to the Architect/Engineer not less than ten (10) calendar days prior to the bid date. Any and all replies to said requests will be made in the form of an addendum which shall be made available to all bidders. Any equipment and/or materials installed by this Contractor not manufactured by a specified manufacturer or covered under an addendum shall be removed by this Contractor and the proper equipment or materials installed at no additional expense or delay to the Owner.

O. This contractor shall furnish to the Owner, after approval of shop drawings, three (3) wiring sample boards. Each sample board shall be made of minimum space ½” thick plywood and sized as required to accommodate all wiring samples. Each board shall be painted white and shall have samples of fire alarm, all sound reinforcement systems (divided by system), multi-media, security, CATV, door access video entry, and telecommunications wiring. Each wiring sample shall be a minimum of 6 inches long with the manufacturer and model number clearly visible. Each wiring sample shall be properly labeled for its intended purpose using a labeling machine.
1.6 EQUIPMENT DEVIATIONS

A. Where this Contractor proposes to use, and/or uses, an item of equipment other than that specified or detailed on the Drawings, which requires any redesign of any other part of the electrical, mechanical, or architectural layout, all such redesign and all new drawings and detailing required shall be prepared by this Contractor at no additional expense to the Owner and shall be reviewed by the Architect/Engineer.

B. Where such approved deviation requires a different quantity and arrangement of duct work, piping, wiring, conduit, and equipment, this Contractor shall furnish and install any such duct work, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit, and any other additional equipment required by the system at no additional expense to the Owner.

1.7 QUALIFICATIONS FOR BIDDERS

A. This Contractor shall examine drawings and Specifications relating to the work of all trades and become fully informed as to the extent and character of work required and its relation to all other work in the project prior to submission of bid or prior to the start of any construction.

B. Before submitting bid, this Contractor is encouraged to visit the site and examine all adjoining existing buildings, equipment, and space conditions including areas above accessible ceilings on which his work is in any way dependent, for the best workmanship and operation according to the intent of the Specifications and Drawings. This Contractor shall verify dimensions and become fully informed as to the nature and scope of the proposed work and also the conditions under which it is to be conducted. This Contractor shall report to the Architect/Engineer any conditions which, in their estimation, might preclude them from installing the equipment and work in the manner as intended and noted on the Drawings and in this Specification. Failure to take the above precaution shall in no way relieve this Contractor from his obligation to provide the material and work as indicated and as specified at no additional expense to the Owner within the stipulated completion time period.

C. No consideration or allowance shall be granted for failure to visit the site, or for any alleged misunderstanding of materials to be furnished, or work to be done, it being agreed that tender of proposal carried with it agreement to items and conditions referred to herein or indicated in the Drawings.

1.8 DRAWINGS

A. The Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. Do not scale the drawings. Consult the Drawings for the exact location of fixtures and equipment. Where same are not definitely located, this Contractor shall obtain this information from the Architect/Engineer.

B. This Contractor shall follow the Drawings in laying out work and check the Drawings of other trades to verify spaces in which work is to be installed. This Contractor shall maintain maximum headroom and space conditions at all points. Where headroom or space conditions appear inadequate, this Contractor shall notify the Architect/Engineer before proceeding.
C. This Contractor shall call to the attention of the Architect/Engineer of any conflicting information in the Contract Drawings and/or Specifications, by letter or Request for Information (RFI) process. Contractor shall not proceed in error. Conflicts must be resolved.

D. If directed by the Architect/Engineer, this Contractor shall, at no additional expense to the Owner, make reasonable modifications in the layout as needed to prevent conflict with other trades for proper execution.

E. When failure by this Contractor to comply with the work set forth in the above paragraphs results in a conflict, the work shall be modified by this Contractor as directed by the Architect/Engineer at no additional expense to the Owner.

1.9 CONTRACTOR'S WARRANTY

A. This Contractor shall warrant the workmanship, materials, and equipment against defects and/or non-operation as described in SECTION 01 74 00 WARRANTIES AND BONDS.

1.10 COOPERATION WITH OTHER TRADEx

A. This Contractor shall give full cooperation to other trades and shall furnish in writing to the Architect/Engineer any information necessary to permit the work of all trades to be installed satisfactorily with the least possible interference or delay.

B. Where the work of this Contractor will be installed in close proximity to work of other trades, or where there is evidence that work shall interfere with the work of other trades, this Contractor shall assist in working out space conditions to make a satisfactory adjustment. This Contractor shall prepare composite working drawings at a scale not less than 1/4 inch equals 1'-0" , clearly showing how the work is to be installed in relation to the work of the other trades. If this Contractor installs the work before coordinating with other trades or as to cause any interference with work of other trades, this Contractor shall make necessary changes to the work to correct the condition at no additional expense to the Owner.

C. This Contractor shall furnish to other trades, all necessary templates, patterns, setting plans, and shop details for the proper installation of the work and for the purpose of coordinating adjacent work.

PART 2 - PRODUCTS

2.1 STANDARD PRODUCTS

A. Unless otherwise shown on the Drawings or herein specified, each item of equipment furnished by this Contractor shall be essentially the standard product of the manufacturer. Where two (2) or more equipment items of the same kind or class or equipment are required, they shall be the product of a single manufacturer.

B. For equipment consisting of an assembly of multiple components, such multiple components do not have to be the products of a single manufacturer.
2.2 PERFORMANCE DATA

A. All performance data specified herein shall be considered actual performance of equipment as installed. If installation details are such that actual operating conditions unfavorably affect performance as compared to conditions under which the equipment was rated, suitable allowance shall be made by this Contractor.

2.3 QUIET OPERATION

A. All equipment, including the emergency engine generator set, shall operate under all conditions of load without transmission of sound and/or vibration which is found to be objectionable in the opinion of the Architect/Engineer. In case of sound or vibration noticeable outside of the room or space in which it is installed, or annoyingly noticeable inside its' own room or space, it shall be considered objectionable. Sound or vibration eliminators as recommended to eliminate any objectionable sound or vibration shall be furnished and installed by this Contractor if deemed necessary by the Architect/Engineer.

2.04 ELECTRICAL WORK

A. All electrical motors for plumbing and mechanical equipment shall be furnished and installed under Division 23.

B. All starters and phase failure relays required for equipment shall be furnished under Division 23, and shall be installed and wired under this Division of these Specifications.

C. All other electrical devices such as variable frequency drives (VFD), pushbutton stations, selector switches, flow switches, pilot lights, thermostats, etc., for the control or operation of mechanical and plumbing equipment shall be furnished and installed under Division 23. These items shall comply with all Sections of this Division of these Specifications.

D. In all cases where VFD’s or starters are actuated by automatic controls or other devices specified, all necessary components to actuate VFD’s or starters shall be furnished and installed under Division 23.

E. Wiring for automatic temperature control and boiler emergency shut-off shall be furnished and installed under Division 23. All other line voltage control wiring, including interlock wiring for equipment, shall be furnished and installed under this Division unless otherwise noted.

F. Power supply wiring for all equipment shall be furnished and installed under this Division of these Specifications.

G. This Contractor shall coordinate with Division 23 for wiring of approved equipment, and shall coordinate specified control functions.
H. This Contractor shall install all starters furnished under Division 23, and provide all wiring from the power source, through the starter, to the motor. Starters shall not be located above ceilings or other concealed locations. If locations are not shown on the Drawings, this Contractor shall locate starters in utilitarian locations such as electrical rooms, janitor closets, etc., as approved by the Architect/Engineer.

I. This Contractor shall provide all power wiring for VFD’s from the power source, through the VFD, to the motor.

J. This Contractor shall make final power connections to all items of equipment and electrical heat furnished under Division 23.

2.5 PLATES AND SLEEVES

A. All electrical system conduit shall have sleeves for passing through slabs except concrete slabs in contact with grade. All conduit 1-1/2 inch and larger shall have sleeves where the conduit passes through masonry, concrete, tile, and gypsum wall construction. Conduit passing through concrete slabs on grade shall not require sleeves.

B. This Contractor shall furnish and install sleeves in exterior walls below grade for conduits and, the space between the conduit and the sleeve shall be packed with silicon and made completely watertight.

C. This Contractor shall fasten sleeves securely in floors and walls so that they will not become displaced when concrete is poured or when other construction is built around them. This Contractor shall take precautions to prevent concrete, plaster, or other materials from being forced into the space between the conduit and sleeve during construction.

1. This Contractor shall terminate sleeves flush with walls, partitions, and ceilings.

2. In areas where conduits are concealed, this Contractor shall terminate sleeves flush with the floor.

3. In finished areas, where conduits are exposed, this Contractor shall terminate sleeves below the floor and cap. In rooms having floor drains, this Contractor shall extend sleeves 3/4 inch above the floor.

D. Escutcheon plates shall be furnished and installed by this Contractor for all exposed conduits passing through walls, floors, and ceilings. Plates shall be nickel-plated, of the split ring type, and of a size to match the conduit. Where plates are provided for conduits passing through sleeves that extend above the floor surface, this Contractor shall furnish and install deep recessed plates to conceal the sleeves.

E. Sleeves shall be constructed of galvanized rigid steel conduit unless otherwise indicated on Drawings.
2.6 FOUNDATIONS FOR EQUIPMENT

A. The Contractor shall construct reinforced concrete foundations for floor mounted equipment where indicated on the Drawings. Foundations generally shall be built up from structural floor slabs and shall be made of 3000 psi concrete four (4) inches thick unless otherwise indicated or specified. Top edges shall be beveled. All exposed surfaces shall be finished with cement mortar troweled smooth. Reinforcing shall be 6 x 6-10/10 welded wire mesh.

B. This Contractor shall provide reinforced concrete pole base foundations of either the cast-in-place or precast type for the exterior site lighting poles. The poles bases shall be sized and made of 3000 psi, air entrained, concrete with reinforcing as detailed on the Drawings. The top edges of the bases shall be beveled (chamfered) by using the proper type mold, not by grinding the edge once the concrete has set. All exposed surfaces shall be finished smooth without leaving any of the forms imperfections.

1. Cast-in-place concrete pole base foundations shall require this Contractor to provide all excavation and forms.

C. Equipment shall be secured to foundations by this Contractor with anchor bolts embedded in the concrete of ample size and proper arrangements to suit equipment furnished.

PART 3 - EXECUTION

3.1 INSTALLATION OF WORK

A. This Contractor shall examine the site and all Drawings before proceeding with the layout and installation of this work.

B. This Contractor shall arrange the work essentially as shown on the Drawings, exact layout shall be made on the job to suit actual conditions. This Contractor shall confer and cooperate with other trades on the job so all work shall be installed in proper relationship. Precise location of parts to coordinate with other work shall be the responsibility of this Contractor.

C. This Contractor shall arrange for required sleeves and openings. This Contractor shall be liable for cutting or patching made necessary by failure to make proper arrangements in this respect.

D. This Contractor shall provide a full time Job Foreman who shall oversee and coordinate the work with other trades and make proper layout of the work to suit the job conditions and to satisfy the general requirements of the Contract.

3.2 DELIVERY AND STORAGE

A. All materials and equipment shall be delivered in the manufacturer's original packages with seals unbroken and with manufacturer's name and contents legibly marked thereon. This Contractor shall store all materials off the ground, under cover, and protected from the weather and construction.
3.3 SCAFFOLDING, RIGGING, AND HOISTING

A. Unless otherwise specified, this Contractor shall furnish all scaffolding, rigging, hoisting, shoring, and services necessary for the erection and delivery into the premises of any equipment and apparatus furnished and removal of same from premises when no longer required.

3.4 EXCAVATING AND BACKFILLING

A. Mass excavation to approximate building level shall be carried out under DIVISION 01 of these Specifications. This Contractor shall do all trench and pit excavation and backfilling required for the electrical work inside and outside the building, including: repairing of finished surfaces; all required shoring, bracing, pumping; re-stripping; and all protection of safety of persons and property. The method of backfilling shall conform to the requirements of Alexandria. In addition, it shall be the responsibility of this Contractor to check the indicated elevations of utilities entering and leaving the building. If such elevations require excavations lower than the footing levels, the Architect/Engineer shall be notified of such conditions and redesign shall be made before excavations are commenced. It shall also be the responsibility of this Contractor to make the excavations at the minimum required depths in order not to undercut the footings.

B. Conduits installed below the ground floor level shall have the bottom of the trench excavated to grade so that the conduit shall rest on a solid bed of undisturbed earth. If rock is encountered, the trench shall be excavated to not less than three (3) inches below required grade and filled to required grade with sand so as to provide a solid bed under the entire length of conduit.

C. Where the trench is excavated below the required depth, the trench shall be filled with sand and fine gravel so that the entire length of conduit rests on solid bed of sand.

D. Backfilling to one (1) foot above the top of the conduit pipe shall be done by hand, using clean dirt free of rocks or other debris. All backfill shall be properly compacted in accordance with DIVISION 02 of this Specification. Utility tracing tape shall be placed by this Contractor above underground electrical work approximately one (1) foot below finished grade for the entire length of the installation.

3.5 ACCESSIBILITY

A. This Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate thickness of partitions, and the adequate clearance in double partitions and hung ceilings for the proper installation of the work. This Contractor shall cooperate with all other trades whose work is in the same space, and shall advise each trade of their requirements. Such spaces and clearances shall, however, be kept to the minimum size required.

B. This Contractor shall locate all equipment that must be serviced, operated, or maintained in fully accessible positions. This equipment shall include, but not be limited to, disconnect switches, panelboards, transformers, controllers, switchgear, motor control centers, generators, junction boxes and pullboxes, and the like. If required for better accessibility, this Contractor shall furnish access doors or panels for this purpose. Minor
deviations from the Drawings may be made to allow for better accessibility, and all changes shall be approved by the Architect/Engineer.

C. This Contractor shall furnish and install access panels as required for access to junction boxes, etc. The panels shall be twelve (12) inches square, unless otherwise required to be larger, with hinged metal door and metal frames. Door and frame shall be not lighter than sixteen (16) gauge sheet steel. Access panels shall be the flush type with screwdriver latching device. The frame shall be constructed so that it can be secured to the building material. Access panels and their locations shall meet with the approval of the Architect/Engineer.

3.6 DEMOLITION

A. This Contractor shall perform all demolition work as shown on the Drawings and specified herein.

B. The procedures used for the accomplishment of demolition work shall provide for safe conduct of the work, careful removal and disposition of material specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services.

C. Work shall be performed in sequence, locations, and time periods as agreed to by the Owner prior to commencement of work.

D. The amount of dust resulting from demolition shall be controlled to avoid creation of a nuisance in the surrounding area. Masks shall be worn for protection against dust inhalation by all persons in the vicinity of work involving removal of masonry.

E. Protection of Existing Work:
   1. Existing work and finishes to remain shall be protected from damage. Work damaged by this Contractor shall be repaired to match existing work at no additional expense to the Owner.
   2. This Contractor shall cover equipment as necessary to protect it from dust.
   3. Floors shall be protected by this Contractor from damage.
   4. At the end of each workday and during inclement weather, this Contractor shall close exterior openings with weatherproof covers.
   5. At the end of each workday this Contractor shall broom clean the entire project.

F. This Contractor shall comply with all Federal and local regulations pertaining to environmental protection.

G. Existing equipment and materials shall be dismantled and/or cut-up so as to be removable through existing access passages. No alterations to the building shall be made for the purpose of removing existing equipment and material.

H. All equipment removed shall remain in the property of the Owner and shall be stored or
I. Clean-up:

1. This Contractor shall remove debris and rubbish from the site. Do not allow to accumulate in building or on site.

2. This Contractor shall remove and transport debris in a manner so as to prevent spillage on site or adjacent areas.

3. Local regulations regarding hauling and disposal shall apply.

J. Modifications to Existing Electrical Systems:

1. This Contractor shall ensure that all demolition and modifications to existing electrical systems and associated equipment shall be by a qualified electrician.

2. This Contractor shall remove such existing work as called for on the Drawings and/or as required to clear the areas for new construction. Remove each item of equipment, devices including low voltage devices, luminaires (lighting fixtures), etc. and it’s associated circuitry back to the source of power (switchboard, panelboard, controller, control panel, equipment rack, etc.). Associated circuitry includes conduit, conductors, boxes, wiring devices, coverplates, lamps, ballasts, wireways, switches, starters, etc. which are associated with the item being removed.

3. Except as otherwise noted on the Drawings, all existing electrical work which will not be rendered obsolete and which may be disturbed due to any changes required under this Contract shall be restored to it’s original operating condition. Contractor shall make all necessary provisions to maintain ALL electrical systems, including communications and other low voltage systems, by extending wiring, conduit, relocating equipment, installing new temporary equipment and/or wiring, etc.

4. Electrical work or material rendered obsolete shall be abandoned where concealed in walls and floor slabs and removed where exposed, and/or where made exposed by the removal of walls and/or ceilings. Where a concealed conduit is abandoned and the terminated end is exposed above an accessible ceiling the end shall be capped or sealed in an approved manner. Where a concealed abandoned conduit is terminated in a finished space the conduit shall be removed to below the finished surface (minimum three inches for concrete floor slabs) and the void filled with non-shrinking grout and finished to match the surrounding surfaces.

5. Unused flush device outlet boxes or junction boxes shall be provided with blank coverplates.

6. Where equipment is identified or required to be relocated its associated circuitry shall also be removed, as herein before described, along with its associated devices, etc. Provide all electrical connections to the relocated equipment to new or extended circuitry as indicated on the Drawings and/or required to make the disposed of as directed.
equipment fully functional.

7. Power, communications and other low voltage systems that will be reconnected or extended permanently or temporarily shall be identified and marked above the ceiling during the demolition and phased construction periods.

8. Where existing electrical work interferes with new work, and where such installations are to remain in use, the installation shall be disconnected and/or reconnected to coordinate with the work indicated on the Drawings and as herein specified.

9. Except as otherwise indicated, panelboard cabinets shall not be used for other purposes than circuit protection and distribution points and shall not be used as junction or pullboxes.

3.7 CUTTING AND PATCHING

A. All cutting and patching of existing construction required for work under this DIVISION of these Specifications shall be performed by this Contractor in accordance with SECTION 01045 CUTTING AND PATCHING.

3.8 PERSONNEL INSTRUCTION AND OPERATING INSTRUCTIONS

A. This Contractor shall furnish to the Architect/Engineer for delivery to the Owner, four (4) bound and indexed copies of an approved operations and maintenance instruction booklet along with a copy of the submittal data for each item of equipment installed under this Contract. The submittal data shall include all low voltage “special systems” drawings and floor plans, updated to include any deviations to the system(s) and/or the building layout to properly reflect “as built” conditions.

B. After all tests are conducted and approved as specified below, this Contractor shall furnish a competent operations engineer for a period of two (2) days to instruct and demonstrate to the Owner, or his authorized representative, the operation of each system. This Contractor shall notify the Architect/Engineer in writing of the person to whom this instruction was given and the date given. This Contractor shall provide at least one (1) weeks’ notice to the Owner when conducting tests or demonstrations of equipment.

C. This Contractor shall furnish to the Owner as part of the Owner's operating and personnel instruction package, one (1) bound set of marked up drawings indicating any changes made during construction to the original contract drawings. The set shall be clearly labeled, "As Built Plans."

D. This Contractor shall furnish complete Technical Service Manuals with component schematics and parts lists as indicated in appropriate section for each system.

3.9 TESTS

A. This Contractor shall, at his expense, conduct a capacity and general operating test on each system. The test shall demonstrate the specified capacities of the various pieces of equipment, and shall be conducted in the presence of the Architect/Engineer and the
Owner. The general operating tests shall demonstrate that the entire equipment system is functioning in accordance with the Drawings and Specifications. This Contractor shall furnish all instructions, test equipment, and utilities.

B. After all systems are completely tested, this Contractor shall submit four (4) copies of the test results to the Architect/Engineer for review. Final inspection shall not be made until test results have been reviewed by the Architect/Engineer.

3.10 CLEANING

A. This Contractor shall thoroughly clean all electrical equipment installed under this DIVISION of these Specifications after the system has been completed or used for temporary service, but in any case prior to final inspection by the Owner's representatives.

B. Cleaning shall include, but not be limited to, luminaires (lighting fixtures), wiring devices, cover plates, distribution equipment, and the like.

3.11 GUARANTEE

A. This Contractor shall guarantee by acceptance of the contract that all work installed shall be free from any and all defects in workmanship and/or materials, and that all apparatus shall develop capacities and characteristics specified, and that if during the phased construction and warranty period such defects in workmanship, materials, or performance appear, this Contractor shall with no additional expense to the Owner, remedy such defects within a reasonable time. In default thereof, Owner may have such work done and charge the cost to this Contractor.

3.12 IDENTIFICATION

A. This Contractor shall furnish an "As-Built" power systems riser diagram indicating service entrance switchboard, panelboards, emergency engine generator set, automatic transfer switch, dimming systems, and safety switches. Diagram shall indicate size of feeders and conduit, breakers, circuit, and fuses. The diagram shall be neatly drawn, using mechanical drafting methods, at least 24 inches x 36 inches, laminated, and hung from the wall adjacent to service entrance switchboard as directed by the Owner.

B. This Contractor shall refer to the appropriate sections of these Specifications for identification requirements for junction boxes, branch and feeder conductors, underground wiring, low voltage special systems wiring and the like.

3.13 LOCK-OUT/TAG-OUT PROCEDURES

A. This Contractor shall have an established lock-out/tag-out procedure which meets the requirements of VOSH Standard 29 CFR Part 1910, Subpart J, Subsection 147, entitled "Control of Hazardous Energy Sources". This Contractor shall coordinate with the Owner's representative to insure conformance with the Owner's lock-out/tag-out program requirements.

END OF SECTION
SECTION 26 05 09

WIRE, CABLE, AND CONNECTORS

PART 1 - GENERAL

1.1 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.2 SCOPE

A. The work covered under this Section shall include furnishing and installing wire, metal-clad cable, two hour fire rated conduit cable, and connectors for all power wiring systems as shown on the Drawings and herein specified.

B. Wiring for data, communication, electronic, fire alarm, or other low voltage and special systems shall be provided as specified in the appropriate specialty Section of these Specifications.

1.3 QUALITY ASSURANCE

A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.

B. All equipment and materials shall be listed by Underwriters Laboratories, Inc. (UL) for their intended use and shall bear the UL label.

C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.

D. Submittals are required in accordance with SECTION 26 05 00 of these Specifications.

1. Submittals shall include a preliminary schedule to perform the infrared scans described in Part 3 of this specification. The schedule shall be based on the contractual substantial completion date for this project.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. All conductors shall be new soft drawn high conductivity copper and shall be delivered to the site in their original unbroken packages plainly marked as follows:

1. UL Label.
2. Size, type and insulation rating of the wire marked every four (4) feet along the length.

3. Name of the manufacturing company and the trade name of the wire.

B. All conductors shall have 600 volt insulation, unless specified otherwise. The minimum operating temperature of the conductor’s insulation shall be 75° C.

C. Where conductors are installed in a raceway, in dry and damp locations, conductor insulation shall be rated 75° C. Type THWN or dual rated THWN/THHN.

D. Where conductors are installed in a raceway, exposed to excessive temperatures, conductor insulation shall be rated 90° C. Type THHN, THWN/THHN (dual rated), XHHW or XHHW-2.

E. Where conductors are installed in a raceway, in wet locations, conductor insulation shall be rated 75° C. Type XHHW (wet locations), or XHHW-2 rated 90° C. (dry and wet locations) as appropriate.

F. Conductors on the secondary side of variable frequency drives (VFD) shall be Type XHHW or XHHW-2 as appropriate.

G. The minimum conductor size shall be No. 12 AWG, except for control wiring (minimum size shall be No. 14 AWG), and as stated in other Sections of these Specifications, or as shown on the Drawings. Conductors for 120/277 volt control signals shall not be considered as control wiring.

H. Branch circuits for emergency lighting, including illuminated exit signs, shall be a minimum of No. 10 AWG.

I. Conductors smaller than No. 8 shall be solid; No. 8 and larger shall be stranded.

J. All conductors throughout the project shall be color coded to identify phases, neutral, and ground. Color-coding shall be as follows:

<table>
<thead>
<tr>
<th>SYSTEM VOLTAGE</th>
<th>CONDUCTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>120/208</td>
<td>Phase A</td>
</tr>
<tr>
<td>277/480</td>
<td>Phase B</td>
</tr>
<tr>
<td></td>
<td>Phase C</td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
</tr>
<tr>
<td></td>
<td>Ground</td>
</tr>
</tbody>
</table>

- Phase A: Black
- Phase B: Red
- Phase C: Blue
- Neutral: White
- Ground: Green
- Brown
- Orange
- Yellow
- Gray
- Green

K. Insulated conductors size No. 6 A.W.G. and smaller shall have the insulation color-code identification factory applied for the entire length of the conductor. On larger sizes, provide color-coded phasing tape at each box and connection. White or gray colored insulation shall only be used for grounded (neutral) conductors. For multiple neutrals run...
in the same conduit, provide separate neutral conductors with a continuous, factory
applied tracer stripe matching the color of the respective phase conductor. Green colored
insulation shall only be used for equipment grounding conductors.

L. Where conductor size is not indicated, its current carrying capacity shall be equal to or
greater than the rating of its overcurrent protective device.

M. Where conductor sizes are increased for voltage drop or other reasons the equipment
grounding conductor (when provided) shall be increased in size proportionately.

N. Where conductor sizes are increased for voltage drop they may be reduced in size within
ten feet of the termination in order to fit under the lugs available on the overcurrent
protective device but not less than the ampacity of the frame size of the overcurrent
protective device.

2.2 METAL-CLAD CABLE

A. The Contractor shall furnish and install where shown on the Drawings or specified herein,
metal-clad cable, type “MC”, of the size and number of conductors noted on the
Drawings. The metal-clad cable shall be a factory assembly of one or more conductors,
including a green insulated ground wire enclosed in a galvanized steel interlocked metallic
sheath. Metal-clad cable with an aluminum sheath will not be acceptable.

B. Conductors shall be copper with a minimum size of No. 18 A.W.G., solid (through No. 10
A.W.G.) or stranded (No. 8 and larger), Type THHN/THWN (90° C.), and 600 volt.
Color-coding of conductors shall be as hereinbefore described.

C. Fittings for metal-clad cable shall be all steel, approved for use with metal-clad cable.
Cast pot metal types are not acceptable.

D. Metal-clad cable shall be UL listed and marked in accordance with NEC Article 310.11.
Manufacturer’s standard color-coding on the exterior sheath may be used. Metal-clad
cable shall be as manufactured by AFC CABLE SYSTEMS or CM & ELKINS (CME)
WIRE AND CABLE or SOUTHWIRE COMPANY.

PART 3 - EXECUTION

3.1 IDENTIFICATION OF CONDUCTORS

A. All branch circuits, including grounded (neutral) conductors, shall be tagged in the
panelboards, in all gutters, and in all junction boxes where circuits terminate for the
purpose of identifying the various circuits.

B. Feeders and mains shall be tagged in the distribution switchboards, panelboards, and
within junction and pull boxes.

C. The method of tagging shall be with an adhesive type of marker. Tagging shall clearly
distinguish between 120/208 volt and 277/480 volt conductors.

D. Tags shall be applied after wire is installed in conduit.
E. Where it is impractical to use printed markers on certain wires or cables, use blank type with identification marked thereon in indelible pencil.

3.2 INSTALLATION

A. Conduit/raceway system shall be complete prior to pulling in wires.

B. Any run of conduit/raceway which does not permit conductors to be pulled in readily shall be condemned and replaced to the satisfaction of the Architect/Engineer and Owner.

C. Conductors shall be continuous between outlets or junction boxes and no splices shall be made except in outlet boxes, junction boxes, and handholes.

D. Do not combine systems of various voltages or circuits from separate sources in the same raceway or conduit system, regardless of the voltage rating of the conductors, unless otherwise shown on the Drawings.

E. All joints, splices and taps for conductor sizes No. 10 and smaller (including luminaire pigtails) shall be connected with approved type crimp connectors, or spring type screw-on connectors (wire-nuts) with insulating skirts; No. 8 and larger shall be connected with solderless THOMAS & BETTS high pressure connectors with heat shrink insulation that possess equivalent or better mechanical strength and insulation ratings than that of the unspliced conductor. Refer to Specification Section 26 05 33 for splices and taps within wiring troughs. The use of pressure connectors is not acceptable.

F. Oil, grease or silicon, which could damage the insulation of the conductors or cables, shall not be used when pulling conductors. Use only UL approved cable lubricants approved for the purpose.

G. Train conductors neatly in panelboards, cabinets, and other electrical equipment. Installed conductors shall allow for a minimum of one (1) future re-termination.

H. Tighten pressure type lugs on switchboards, panelboards, motors and other equipment to the manufacturer’s published torque-tightening values. If manufacturer’s torque values are not indicated, use those specified in UL 486A and 486B.

I. Conductors in vertical conduit runs shall be supported with split-wedge type fittings that clamp each conductor and tighten under the weight of the conductors at intervals required by the NEC.

J. All wiring within the building structure, crawlspaces, and slabs shall be installed in conduit unless indicated or specified otherwise.

K. Homeruns longer than seventy five (75) feet from a 120/208 volt panelboard or one hundred seventy five (175) feet from a 277/480 volt panelboard shall be not less than No. 10 AWG, copper.

L. No more than three (3) current carrying phase conductors shall be installed in any one conduit, unless explicitly shown on the drawings.
M. Connect circuits and feeders as shown on the Drawings. Drawings are diagrammatic and do not show every detail required in the wiring system.

N. Install wiring so conductors are not in tension in completed systems.

O. All conductors making up parallel feeders shall be the same size, same type, same insulation and all cut the same length. Bond each group of conductors making up a phase or neutral at both ends in an approved manner. Parallel conductors shall not be run in the same raceway.

P. Provide a separate neutral and grounding conductor (or conduit ground) for all GFI circuits or GFI devices to ensure an adequate ground-fault path.

Q. Branch circuits requiring a neutral conductor shall have one neutral conductor per phase conductor when installed in a common raceway, unless specifically shown otherwise on the Drawings.

R. Conductors or cables installed in conduit or tubing exposed to direct sunlight on rooftops require temperature adjustment factors in accordance with the values in NEC 2008 Table 310.15(B)(2)(c).

3.3 METAL-CLAD CABLE

A. Metal-clad cable may be used in dry locations for connections in casework, for “fished” applications in existing partitions or walls, above accessible ceilings in classrooms, offices and similar locations and within newly installed drywall partitions. Metal-clad cable may also be used as a “whip” connection from an outlet box (secured to the building structure) to a recessed luminaire (lighting fixture) (minimum, 4 feet; maximum, 6 feet in length) above accessible ceilings in lieu of flexible metal conduit as stated in Section 26 05 33.

B. Metal-clad cable may not be used for feeders, homeruns or within corridors, except for recessed luminaire (lighting fixture) connections as described above. Metal-clad cable shall not be used in areas without a ceiling, in areas without an accessible ceiling or from corridors into adjacent rooms.

C. Metal-clad cable shall be installed and supported in accordance with NEC Article 330.30 and these specifications. Supports shall be zinc-coated or equivalent corrosion protection. Individual hangers, straps or similar fittings shall be used and installed at intervals so as not to damage the cable. Where fastened to walls use appropriate anchors and screws, the use of drive pins and/or other methods using compressed air or gases are not acceptable. Supports shall not terminate or be fastened directly to the roof decking. MC Cable under roof decking shall not be less than 1 ½ inches from the nearest surface of the roof decking. Supports attached to structural steel joists shall only be attached within 3” of the joist panel points, top or bottom. Supports attached to structural steel joists shall only be attached within 3” of the top of the joist panel points. Supports attached at the bottom or beyond 3” of the joist panel points must be approved, in writing, by the Structural Engineer of record and the Owner before attaching.

D. Bending radius for the metal-clad cable shall be in accordance with NEC Article 330.24.
E. Fittings used for connecting the metal-clad cable to boxes, cabinets, or other equipment shall be all steel UL listed and identified for such use.

F. Metal-clad cable shall be installed parallel or perpendicular to walls. No diagonal runs shall be permitted.

G. Metal-clad cable shall not be installed within three (3) inches of hot water pipes, or appliances, except at crossings where metal-clad cable shall be a least one (1) inch from pipe cover.

H. Metal-clad cable shall not interfere with accessible ceiling tiles. Access to electrical or other equipment shall not be denied by runs of MC cable that prevents removal of panels, including suspended ceiling panels.

I. Flattened, dented, deformed, or open armor is not permitted. If damaged during installation, damaged cables shall be replaced with new undamaged material.

J. Horizontal or cross runs in solid masonry partitions or walls shall not be permitted.

K. All horizontal penetrations through new or existing walls shall be sleeved. No other type of wiring systems shall occupy the same penetration sleeve with the MC cable. Sleeve penetrations through fire-rated walls, after installation of MC cables, shall be fire stopped using a product similar to THOMAS & BETTS “Flame-Safe” fireretardant.

3.4 FIELD QUALITY CONTROL

A. After installing conductors and cables and before electrical circuitry has been energized, perform the following visual and mechanical inspections:

1. Verify cables and conductors comply with the contract documents.

2. Verify cables and conductors are braced for short circuit stresses where specified.

3. Verify cables and conductors are correctly identified at each termination, splice and tap where applicable.

4. Verify correct phase rotation is maintained throughout project.

5. Verify color coding and identification complies with specifications and the National Electrical Code.

6. Inspect all exposed sections of cables and conductors for physical damage and correct connection.

7. Inspect all bolted and compression connections.

B. Verify phase identification is A, B, C, left to right, front to back and top to bottom. If corrections are required change feeder and branch circuit identification at each end of circuit so that correct phase identification is maintained throughout the project. If
incorrect identification is noted on existing systems notify the Architect/Engineer and Owner for action to be taken.

C. Infrared Scanning: After Substantial Completion, but not more than sixty (60) days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger and a complete infrared scan of each panel board, switchboard, and lug terminations of each chiller and motor terminations 20 HP and larger. Remove box and equipment covers so splices and lugs are accessible to portable scanner.

1. Perform a follow-up infrared scan for all splices and terminations previously described approximately eleven (11) months after date of Substantial Completion, but must be during normal school (business) operating hours.

2. Contractor shall submit to the Architect/Engineer and Owner, at time of final inspection, a schedule to perform the infrared scans during normal school (business) operating hours while the building is in full operation, under load. Re-terminations requiring any power shut-downs must be coordinated with the Owner and performed during non-school (business) hours.

3. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Record of Infrared Scanning: Prepare a certified report that identifies equipment and splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken and observations after remedial action.

D. Remove and replace malfunctioning units then verify, inspect and retest as specified above.

END OF SECTION
PART 1 - GENERAL

1.1 REQUIREMENTS
   A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.2 SCOPE
   A. The work under this Section shall consist of furnishing and installing grounding systems as shown on the Drawings and herein specified.

1.3 QUALITY ASSURANCE
   A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.
   B. All equipment and material shall be listed by Underwriter's Laboratories, Inc. (UL) for their intended use and shall bear the UL label.
   C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.

1.4 DESCRIPTION
   A. The equipment grounding system shall be designed so all building steel, metallic structures, raceways, enclosures, cabinets, machine frames, junction boxes, outlet boxes, portable equipment, and all other conductive items in close proximity with electrical circuits operate continuously at ground potential providing a low impedance path for possible ground fault currents.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS
   A. The equipment grounding conductors and straps shall be sized in compliance with the NEC. All equipment grounding conductors shall be provided with green insulation equivalent to the insulation on the associated phase conductors. The related feeder and branch circuit grounding conductors shall be connected to the ground bus with pressure connectors. A feeder serving several panelboards shall have a continuous grounding conductor which shall be connected to each related cabinet ground bus.
   B. This Contractor shall furnish and install a separate green insulated equipment grounding
conductor for each single- or three-phase feeder and each branch circuit with a two-pole or three-pole protective device. The required grounding conductor shall be installed in the same raceway with the related phase and/or neutral conductors. Where there are parallel feeders installed in more than one raceway, each raceway shall have a green insulated equipment ground conductor. Single-phase branch circuits required for 120 and 277 volt lighting, receptacles, and motors shall consist of phase and neutral conductors installed in a common metallic raceway, which shall serve as the grounding conductor. Flexible metallic conduit equipment connections utilized in conjunction with the above single-phase branch circuits shall be provided with suitable green insulated grounding conductors connected to grounding terminals at each end of the flexible conduit.

C. This Contractor shall furnish and install in the same raceway with the associated phase and/or neutral conductors, a green colored equipment ground conductor having the same type insulation and connected as described below.

1. Where electrical devices, such as heaters, are installed in air ducts, provide a green insulated equipment ground conductor sized in accordance with the NEC based on the rating of the overcurrent device supplying the unit. This conductor shall be bonded to the ground bus in the associated panelboard.

2. From the equipment ground bus in panelboards through raceways and flexible metallic conduit to ground terminal in a connection box mounted on three-phase motors, furnish and install a ground conductor sized as herein specified. Where the motor has a separate starter and disconnecting device, the ground conductor shall originate at the ground bus in the panelboard. Motors shall be bonded to each starter and disconnecting device enclosure.

PART 3 - EXECUTION

3.1 POWER SYSTEM GROUNDING

A. Branch circuit grounding: This Contractor shall furnish and install grounding bushings, ground terminal blocks, and grounding jumpers at distribution centers, pullboxes, panelboards, and the like.

B. Bonding jumpers: This Contractor shall furnish and install a green insulated bonding conductor (size shall correlated with the over-current device protecting the conductor) attached to grounding bushings on the raceway, to lugs on boxes, and other enclosures.

C. Bonding conductors: This Contractor shall furnish and install a bonding conductor in all flexible conduits connected at each end to a grounding bushing.

D. All electrical outlets shall be connected from the device grounding terminal to the outlet box with No. 12 AWG green insulated conductor. This Contractor shall furnish and install a green screw terminal in the outlet box and a continuous green ground conductor from the green terminal screw to the grounding systems as indicated on the Drawings.
3.2 TESTS

A. The completed grounding system shall be subjected to a ground resistance test with an earth test megger to ensure that the ground resistance, without chemical treatment or other artificial means, does not exceed five (5) ohms at the service entrance equipment’s ground bus. The Contractor shall furnish and install additional ground rods and conductors from the exterior ground grid to achieve the required resistance to ground. Testing equipment must be calibrated to the manufacturer’s requirements. Upon request, the Contractor shall provide documentation of the testing equipment’s most recent calibration.

B. In addition to the above, steel framed buildings shall be subjected to a ground resistance test with an earth test megger for the adequacy of the steel framing of the building as a grounding electrode system for five (5) ohms or less. Testing shall be at all of the secondary building ground bar connection points. If testing results do not meet the required resistance, the engineer must be notified.

END OF SECTION
PART 1 - GENERAL

1.1 REQUIREMENTS
A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.2 SCOPE
A. The work covered under this Section shall consist of furnishing and installing conduits, raceways, and fittings for all systems as shown on the Drawings and herein specified.

1.3 QUALITY ASSURANCE
A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.
B. All equipment and materials shall be listed by Underwriters Laboratories, Inc. (UL) for their intended use and shall bear the UL label.
C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.
D. Submittals are required in accordance with SECTION 16010 of these Specifications for conduits, raceways, fittings, wiring troughs, cable hooks, cable trays and associated support systems.

PART 2 - PRODUCTS

2.1 CONDUITS
A. Minimum conduit size shall be 1/2 inch. No more than six (6) No. 12 AWG conductors shall be pulled in 1/2 inch conduit. For conductors larger than No. 12 AWG or quantities of No. 12 greater than six (6) conductors, 3/4 inch conduit shall be the minimum size. Other sizes shall be as indicated on the plans, or as required by the NEC for number and size of conductors installed. Materials shall be new and full length. Crushed and/or deformed conduits shall not be used.
B. Rigid steel and intermediate metal (IMC) conduits shall be full weight threaded and galvanized steel pipe of standard pipe dimensions.
C. Electrical metallic tubing (EMT) shall be threadless thin wall conduit, galvanized or zinc metallized.
D. Flexible steel conduit shall be single-strip type, galvanized. Use for short connections where rigid type conduits are impractical, for expansion joint crossing, from outlet box to a recessed luminaire (lighting fixture) (minimum, 4 feet; maximum, 6 feet in length), for final connections to motor terminal boxes or other vibrating equipment. Use only steel connectors approved for flexible conduit. Provide an internal ground wire with proper fittings. Other uses on the project shall not be permitted.

E. Flexible weatherproof conduit shall have polyvinyl sheathing similar to AMERICAN METAL HOSE "Sealtite" type "UA" and shall be used where exposed to the weather to connect all motors; all rooftop mounted equipment, and all other wet locations, where rigid type conduits connections are impractical. Weatherproof flexible conduit installations shall have maximum lengths of ± twenty-four (24) inches. Use only steel connectors approved for flexible weatherproof conduit. Provide an internal ground wire with proper fittings. Other uses on the project shall not be permitted, except where indicated hereinafter in these specifications or as shown on the drawings.

F. Plastic conduits shall be installed only underground or in a concrete slab on grade. Only heavywall (Schedule 40) plastic conduit shall be used. Where conduit turns out of a concrete slab or finished grade, inside or outside the building, provide a rigid steel conduit elbow and suitable adaptor between plastic and steel conduits. No plastic conduit shall be used inside the building or exposed outside the building, unless otherwise noted on the Drawings.

G. This contractor can use for exterior, underground, pole mounted luminaire branch circuit wiring, schedule 40 high-density polyethylene (HDPE) piping. Where conduit turns out above finished grade, provide a rigid steel conduit elbow and suitable adaptor between plastic and steel conduits. No plastic conduit shall be used exposed outside the building, unless otherwise noted on the Drawings. A HDPE pipe that meets this specification is DURA-LINE Cat. No. EPEC-40/SCH 40 (black) or approved equal.

2.2 FITTINGS

A. Fittings, couplings, and accessories shall be compatible with the conduit material.

B. Unions, couplings, and fittings for rigid and IMC conduits shall be of galvanized steel of conventional dimensions and shall be internally threaded at each end to fit the nontapered thread standard for the corresponding size conduit. Couplings and fittings for electrical metallic tubing shall be of steel and shall be of the compression or setscrew type. Cast pot metal and crimp types are not acceptable.

C. Conduit bodies used with conduits 1½ inches and larger shall be galvanized cast iron “mogul conduit bodies” complete with a domed and angled cover, neoprene gasket, stainless steel screws, and rated for “wet locations”.
2.3 BUSHINGS AND LOCKNUTS

A. Use OZ/GEDNEY type 'B' insulated or type 'BLG' bushing where necessary to bond conduit to ground connection. Bushings shall be as manufactured by OZ/GEDNEY, THOMAS & BETTS, or CROUSE-HINDS.

B. Locknuts shall be used on both sides of conduit connections to a box or a panelboard in addition to the bushing. Where a larger size opening occurs than the size of the conduit, use reducing locknuts. Do not use reducing washers.

2.4 WIRING TROUGHS

A. Wiring troughs complete with screwed covers shall be used where indicated and for mounting groups of switches and/or starters. Wiring troughs shall be the standard manufactured product of a company regularly producing wiring troughs and shall not be a local shop assembled unit. Wiring trough shall be UL listed and of sizes indicated or as required by NEC, if not indicated. The interior, including couplings shall be completely open without interference. Finish shall be ASA #49 medium light gray enamel over a rust inhibitor. Wiring troughs shall be UL listed "Suitable For Wet Locations" and so labeled where indicated "WP" on the Drawings.

B. Wiring connection taps within wiring troughs shall be made using clear self-sealing, self-insulating, multi-tap connectors with transparent flexible insulating covers. The connectors shall be securely fastened. The multi-tap connector shall be manufactured by ILSCO, Series “PCT” ClearTap or approved equal.

2.5 CABLE HOOK SUPPORT SYSTEMS

A. Cable hooks (also known as “J” hooks) shall be provided for low voltage cable systems as hereinafter specified in other sections of these specifications.

B. Cable hooks shall provide a flat bottom bearing surface of sufficient width to comply with required bend radii of high-performance cables.

C. Cable hooks shall have flare edges to prevent damage while installing cables.

D. Cable hooks shall be designed so the mounting hardware is recessed to prevent cable damage.

E. Cable hooks sized 1-5/16 inches and larger shall have a stainless steel cable latch retainer to provide containment of cables within the hook. The retainer shall be removable and reusable and be suitable for use in air handling spaces.

F. Cable hooks shall be factory assembled for direct attachment to walls, hanger rods, beam flanges, purlins, strut, floor posts, etc. to meet job conditions.

G. Multi-tiered cable hook assemblies shall be used where required to provide separate cabling compartments, or where additional capacity is needed. Assemblies may be factory
assembled or assembled from pre-packaged kits. Assemblies shall consist of a steel angled hanger bracket holding up to six (6) cable hooks.

H. Cable hooks for non-corrosive areas shall be pre-galvanized steel, ASTM A653. Where additional strength is required, cable hooks shall be spring steel with a zinc-plated finish, ASTM B633, SC3. Cable hooks for corrosive areas shall be stainless steel, AISI Type 304.

I. Cable hooks shall be capable of supporting a minimum of 30 pounds with a safety factor of 3. Spring steel cable hooks shall be capable of supporting a minimum of 100 pounds with a safety factor of 3 where extra strength is required.

J. Cable hook manufacturer shall be B-LINE SYSTEMS, INC. Series BCH21, BCH32, BCH64, or equal as manufactured by ERICO CADDY.

2.6 PULL-LINES (CORDAGE)

A. Pull-lines (rope and cordage) types and strengths must be selected and calculated by the Contractor. The selection must be based on the intended use and expected pulling load applications. Design Factor (DF) selections and Working Load Limits (WLL) must be calculated with consideration of exposures to risk and actual conditions of use for each application. Pull-lines shall be in compliance with the latest Cordage Institute Standards and Guidelines.

B. The minimum pull-line tensile strength for insertion into conduits shall be 500 pounds and of the low-friction type.

C. Each utility service entrance conduit (raceway) for power company, telephone company and/or cable television (CATV) company shall have a MULETAPE® pulling tape with numerical values having sequential footage (feet and inches) markings, without splices. The MULETAPE® shall have a minimum tensile strength of 2500 pounds and shall be of the low-friction type with pre-lubrication, high abrasion resistant yarns.

D. Where minimum pull-line strengths are given, they do not negate the Contractor’s responsibility for proper selections and calculations for higher strength pull-lines to suit the application.

2.7 ROOFTOP CONDUIT SUPPORT STRUT SYSTEM

A. Provide rooftop conduit support strut systems that will absorb thermal expansion and contraction of conduits, thus preventing damage to the roof membrane. This Contractor must select the support strut system’s load capacity necessary to carry the weights and sizes of conduits.

B. The conduit support base shall have gently rounded edges to prevent damage to the roof and shall be UV resistant polycarbonate resin or 100% recycled rubber and polyurethane prepolymer, and all other metal parts made of hot-dip galvanized or stainless steel.
C. Conduits shall rest on the strut system made of hot-dip galvanized or stainless steel. Provide fasteners sized for the conduit.

D. Rooftop conduit support system manufacturers shall be MIRO INDUSTRIES, INC. or equal as manufactured by CABLOFIL (CABLO-PORT), COOPER B-LINE (DURA-BLOK™) or approved equal.

PART 3 - EXECUTION

3.1 CONDUITS

A. Panelboard feeders shall be run in electrical metallic tubing (EMT), galvanized rigid steel conduit, intermediate grade metal conduit, or plastic conduit as described herein.

B. Branch circuit raceways for motors twenty (20) horsepower (or tons) and larger, or a combination of motors totaling twenty (20) horsepower and larger requiring a single point connection shall be EMT, galvanized rigid steel conduit, intermediate grade metal conduit, or plastic conduit as described herein.

C. Branch circuit raceways for motors served by variable frequency drives (VFD) shall be electrical metallic tubing (EMT), galvanized rigid steel conduit, or intermediate grade metal conduit from the load side of the VFD to the line side of the motor. Do not use plastic conduit.

D. Feeders, branch circuits, fire alarm system wiring, and other low voltage systems wiring (required to be in conduit) installed indoors in dry locations shall be run in electrical metallic tubing (EMT), galvanized rigid steel conduit, or intermediate grade metal conduit above hung ceilings (accessible and non-accessible), in hollow block walls, in furred spaces, in vertical and horizontal pipe chases, and in exposed dry locations as describe herein and other sections of these specifications.

E. Feeders, branch circuits, fire alarm system wiring, and other low voltage systems wiring installed underground, under slab on grade, in concrete, in crawl spaces, or in wet locations shall be run in galvanized rigid steel conduit, intermediate grade metal conduit, or plastic conduit as described herein.

F. Low voltage systems plenum rated wiring or cables run indoors in dry locations shall be in electrical metallic tubing (EMT), galvanized rigid steel conduit, or intermediate grade metal conduit when run above non-accessible ceilings, in hollow block walls, and in exposed dry locations other than communications rooms or in a cable tray. Refer to the respective low voltage systems sections of the specifications for other conduit requirements.

G. Conduits run exposed in boiler rooms, elevator machine rooms, mechanical rooms, pump rooms, fire sprinkler service room, and all other similar spaces, located between the floor and a height of 10’-0” above the finished floor, shall be galvanized rigid steel conduit, or intermediate grade metal conduit as described herein. Conduits above 10’-0” may be EMT, unless otherwise indicated on the Drawings, or required by codes.
3.2 RACEWAY SYSTEM

A. Raceways shall be continuous from outlet to outlet; from outlet to cabinets, junction boxes, or pullboxes; and secured to all boxes so that each system is electrically continuous from service to outlets. Provide termination of raceways with double lock nuts and bushings.

B. Raceways shall be securely and rigidly supported to the building structure in a neat and workmanlike manner, and wherever possible, parallel runs or horizontal conduit shall be grouped together on adjustable trapeze hangers. Support shall be provided at appropriate intervals not exceeding ten (10) feet with straps, hangers, and brackets specifically designed for the application. Channels shall be 1 inch for 24-inch wide trapeze and 1-1/2 inch for larger than 24 inch. Perforated steel straphangers or tie-wire supports are not acceptable. Conduits installed along wall surfaces shall be supported with galvanized steel brackets specifically designed for conduits and sized for the conduit used. Conduit brackets shall be fastened to the wall using appropriate anchors and screws, the use of drive pins and/or other methods using compressed air or gases are not acceptable. Raceways and supports shall not terminate or be fastened directly to the roof decking. Raceways under roof decking shall not be less than 1½ inches from the nearest surface of the roof decking. Supports attached to structural steel joists shall only be attached within 3” of the top of the joist panel points. Supports attached at the bottom or beyond 3” of the joist panel points must be approved, in writing, by the Structural Engineer of record and the Owner before attaching.

C. Run exposed raceways parallel with or at right angles to walls. In mechanical rooms and similar utilitarian spaces where exposed conduits are used, provide "condulets", and similar fittings in lieu of junction boxes. Exposed outlet boxes of adequate size, however, shall be used to contain wire junctions.

D. No raceway shall be installed within three (3) inches of hot water pipes, or appliances, except at crossings where raceway shall be at least one (1) inch from pipe cover.

E. Install raceway to prevent collection of trapped condensation and be devoid of traps. Slope underground raceways away from the building or provide weep holes when sloping away from the building is not possible.

F. Do not terminate in, or fasten raceways to, motor foundations.

G. Raceways installed outside underground shall have a minimum of twenty-four (24) inches top cover. Separate electric raceways from telephone (and other low voltage systems) raceways with a minimum of twelve (12) inches of well-tamped earth, or six (6) inches of concrete.

H. Joints in raceways in concrete or underground shall be watertight. Steel conduits shall have ends cut square. Ream smooth and paint male threads with graphite-base pipe compound and draw up tight with conduit couplings. Do not paint female threads; where required, use Erickson, or equal, conduit fittings. Running threads shall not be permitted.
Place caps in ends of conduits as soon as located to prevent entry of foreign material. Screwed on caps shall be used for threaded conduits. Unused (abandoned) conduits shall be capped. The use of tape, paper or rag wads in not acceptable for conduit caps.

I. After conduit installation, clean and paint marred surfaces affecting galvanizing with asphaltum, galvanized-iron primer.

J. Run conduit above suspended ceilings for outlets in suspended ceilings. Keep clear of planned ductwork where turning down from slab into suspended ceiling.

K. Horizontal or cross runs in solid partitions and walls shall not be permitted.

L. Conduits designated on the Drawings as empty conduits (EC) shall have a properly sized pull-line.

M. Flexible metal conduit used for connection of luminaires (lighting fixtures), receptacles outlets, telepower poles, and as otherwise shown on the Drawings, shall be supported and bonded in accordance with NEC Article 348.

N. Conduit runs in concrete slabs shall be installed only where shown on the Drawings and shall be limited to 3/4-inch conduit.

O. Where embedded conduits cross building expansion joints, the Contractor shall furnish and install an offset expansion joint or a sliding expansion joint. Sliding expansion joints shall be provided with bonding strap and clamp. Where conduits are exposed, provide expansion fittings or flexible conduit as required.

P. In all wet and damp locations, boiler rooms, elevator machine rooms, kitchens, mechanical rooms, pump rooms, fire sprinkler service room, and all other similar spaces, all final electrical connections to any and all equipment, regardless of the type, shall consist of conductors run in polyvinyl sheathed flexible metal conduit ("Sealtite") with maximum lengths as hereinbefore specified.

Q. Conduits/raceways shall not be permitted to be run exposed on top of finished floors or grade, unless specifically shown on the drawings or approved by the Owner in advance.

R. Raceways or sleeves known to be subjected to different temperatures and where condensation is known to be a problem, as in cold storage areas of (or in) the building or where passing from the interior to the exterior of the building, the raceway or sleeve shall be filled with an approved material to prevent the circulation of warm air to a cold section of the raceway or sleeve, per NEC 300.7.

3.3 CABLE HOOK SUPPORT SYSTEM

A. Installation and configurations shall conform to the requirements of the current revision levels of ANSI/EIA/TIA Standards 568 & 569, NEC, the manufacturer’s installation instructions and other sections of these project specifications.
B. Cable hook assemblies shall be supported from the building structure. Where fastened to walls use appropriate anchors and screws, the use of drive pins and/or other methods using compressed air or gases are not acceptable. Supports shall not terminate or be fastened directly to the roof decking. Cables installed under roof decking shall not be less than 1½ inches from the nearest surface of the roof. Cable hook supports attached to structural steel joists shall only be attached within 3” of the top of the joist panel points. Supports attached beyond 3” at the bottom or the joist panel points must be approved, in writing, by the Structural Engineer of record and the Owner before attaching.

C. Install cables using techniques, practices, and methods that are consistent with Category 5 cables or higher requirements and that support Category 5 or higher performance of completed and linked signal paths, end to end.

D. Install cables without damaging conductors, shield, or jacket.

E. Do not bend cables, in handling or in installing, to smaller radii than minimums recommended by cable manufacturers.

F. Do not exceed load ratings and allowable fill capacity specified by the cable hook manufacturer.

G. Install cable hooks to maintain a minimum three (3) inch clear or higher vertical space above the accessible ceiling tiles for the horizontal cabling and pathway.

3.4 CUTTING AND HOLES

A. Locate holes in advance where they are proposed in structural sections such as ribs or beams. Prior to drilling through any structural section or member, obtain the written approval of the Architect/Structural Engineer of Record and the Owner.

B. Cut holes through concrete and masonry structures with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills are not allowed, except where permitted in advance by the Architect/Engineer and Owner, do to limited working space.

C. Openings in floor slabs or fire-rated walls or partitions for raceways and other electrical equipment shall, after installation of the raceway, be fire stopped using a product similar to THOMAS & BETTS "Flame-Safe" fire retardant.

3.5 ROOFTOP CONDUIT SUPPORT STRUT SYSTEM

A. Rooftop conduit support struts shall be installed in accordance with manufacturer’s instructions and recommendations.

B. Determine that the structure, roof insulation, and roof membrane are structurally adequate to support weight of conduits (with conductors), supports and hangers.
C. Install supports at **maximum** spacing of 10 feet, unless closer spacing is required due to weight of conduits or as shown on the Drawings. Do not exceed manufacturer’s recommended load limits.

D. Support pads: Remove rock or gravel from area to be covered by pad, apply on clean area, and center bases on top of support pads.

E. Set conduit in support without dropping or causing undue impact. Install properly sized clamps to suit conduit sizes.

F. Always consult roofing manufacturer for roof membrane compression capacities. If necessary, a compatible sheet of roofing material (rubber pad) may be installed under rooftop support to disperse concentrated loads and add further membrane protection.

G. Contractor shall adjust conductor sizes in raceways in accordance with the National Electrical Code section 310.15(B)(2)(c) based on an average ambient temperature of 84°F.

END OF SECTION
SECTION 26 05 33.16

DEVICE AND OUTLET BOXES

PART 1 - GENERAL

1.1 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.2 SCOPE

A. The work covered under this Section shall include furnishing and installing device and outlet boxes and flush floor outlets (boxes) complete for all electrical systems as shown on the Drawings and herein specified.

1.3 QUALITY ASSURANCE

A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.

B. All equipment and materials shall be listed by Underwriters Laboratories, Inc. (UL) for their intended use and shall bear the UL label.

C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.

D. Flush floor outlet boxes and/or poke-thru devices shall have been tested to meet UL514A and/or UL514C and bear the UL Listing Mark. Floor boxes/devices shall be classified for use in 2-hour rated unprotected reinforced concrete floors and concrete toppings (D900 Series Designs) or above grade concrete floors with suspended ceilings (fire resistive designs with suspended ceilings shall have provisions for accessibility in the ceiling below the floor boxes/devices). Floor boxes/devices shall also conform to the standards set in Section 300.21 of the National Electrical Code. Floor Boxes/devices shall meet UL scrub water requirements, but are not suitable for wet or damp locations, or other areas subject to saturation with water or other liquids such as commercial kitchens. Floor boxes/devices shall also have been evaluated by UL to meet the applicable U.S. safety standards for scrub water exclusion when used on tile, bare concrete, terrazzo, wood, and carpet covered floors. Above grade floor boxes/devices shall be suitable for use in air handling spacers in accordance with Section 300.22 (C) of the National Electrical Code.

E. Submittals are required in accordance with SECTION 26 05 00 of these specifications.
PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. Boxes shall be steel, hot-dipped galvanized after fabrication, of the type and size for the intended use, and shall have only the holes necessary to accommodate the conduits at point of installation. Multi-gang boxes shall be used for multiple device locations utilizing a single multi-gang cover plate. Sectionalized boxes are not permitted. Boxes shall have barrier separations for conductors using different voltages within the same box.

B. Outlet boxes for lighting switches and receptacles in finished walls shall be of a suitable size for the device to be mounted in the partitions in which they are installed. The boxes shall have covers with rectangular openings of appropriate size and shape. Provide covers with raised openings on all outlets in masonry walls with plaster or tile finishes. Wall switch outlets shall be located within eight (8) inches of the trim on the latch side of the door. Outlets shall be set flush with the wall.

C. Single gang outlet boxes installed in concrete, masonry or gypsum wall board shall be a minimum four (4) inches square, 1-1/2 inches deep with appropriate tile ring, set flush with wall surface and provided with a single gang cover plate.

D. Outlet boxes for exposed lighting switches and receptacles shall be of the cast "FS" type or “FD” type (when required for code required box volume).

E. Outlet boxes for devices shown on the Drawings to be flush mounted in existing gypsum wallboard partitions shall be minimum three (3) inches by two (2) inches by 2-3/4 inches deep gangable switch box type complete with ears and conduit knockouts.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Before locating outlet boxes, check all of the Drawings for the type of construction and to make sure that there is no conflict with other equipment. The outlet boxes' location shall not interfere with other work or equipment and shall be accessible after completion.

B. Outlet boxes shown on the Drawings to be flush mounted in existing gypsum wallboard partitions shall be installed using metal switch box supports similar to STEEL CITY Cat. No. 820-D.

C. Outlet boxes for devices shown on the Drawings to be installed on opposite sides of the same wall shall be separated horizontally by not less than six (6) inches and if connected with each other, the ends of the raceway shall be filled with sound insulating material after wiring has been installed to fill the voids around the wire. For fire rated walls provide minimum 24” separation or use approved fire assembly.

D. Provide only the conduit openings necessary to accommodate the conduits at the individual location. Plug any unused openings.
E. Thoroughly coordinate casework and backsplash heights with mounting heights of boxes.

F. Device and outlet boxes shall not be fastened in place with drive pins and/or other methods using compressed air or gases.

G. Device and outlet boxes located under roof decking shall not be less than 1½ inches from the nearest surface of the roof decking.

END OF SECTION
PART 1 - GENERAL

1.1 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.2 SCOPE

A. The work covered under this Section shall include furnishing and installing surface mounted metal raceways complete for all electrical systems as shown on the Drawings and herein specified. Surface raceway systems shall consist of raceway bases, covers, appropriate fittings, dividers, and device mounting plates necessary for a complete installation.

1.3 QUALITY ASSURANCE

A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.

B. All equipment and materials shall be listed by Underwriters Laboratories, Inc. (UL) for their intended use and shall bear the UL label.

C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.

D. Submittals are required in accordance with SECTION 26 05 00 of these Specifications.

1.4 USES PERMITTED

A. Surface mounted metal raceway shall be used primarily where new wiring is required on existing walls and on new walls as noted on the Drawings.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver raceway systems in factory labeled packages.

B. Store and handle in strict compliance with manufacturer’s written instructions and recommendations.

C. Protect from damage due to weather, excessive temperature, and construction operations.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Surface metal raceways shall be as manufactured by THE WIREMOLD COMPANY or equal product as manufactured by HUBBELL INCORPORATED, as described herein as the basis of design.

B. All components and fittings shall be of the same manufacturer, or UL listed as an assembly.

2.2 MATERIALS AND COMPONENTS

A. All surface metal raceways shall be galvanized steel, unless otherwise indicated. Finish shall be ivory in color (unless otherwise indicated) having a scratch-resistant surface (a polyester topcoat over ivory base) and shall be suitable for field repainting to match surroundings.

B. A full complement of fittings must be available including but not limited to mounting clips and straps, couplings, flat, internal and external elbows, cover clips, tees, entrance fittings, wire clips, support clips, c-hangers, end caps, conduit connectors, bushings, and take-off fittings to adapt to flush wall boxes. The covers shall be painted with an enamel finish, ivory in color to match the raceway. They shall overlap the raceway to hide uneven cuts. All fittings shall be supplied with a base where applicable to eliminate mitering. Transition fittings shall be available to adapt to other raceways manufactured by The Wiremold Company. This Contractor shall provide all fittings, etc. for a complete installation.

C. Device Boxes shall be suitable for the type of raceways provided and for mounting standard devices and faceplates. Devices boxes shall be provided in single- and multiple-gang configurations, up to six-gang. Single-gang boxes shall allow for snap-on and fastener applications. They shall range in depth from 0.94” to 2.75”. Extension boxes shall be provided to adapt to existing standard flush switch and receptacle boxes.

D. The raceway manufacturer shall provide a complete line of connectivity outlets and modular inserts for UTP/STP, Fiber Optic, Coaxial and other cabling types with face plates and bezels to facilitate mounting. A complete line of preprinted station and port identification labels, snap-in icon buttons as well as write-on station identification labels shall be available. Provide as needed for a complete installation.

E. Raceways used for communications cabling shall have a complete line of full capacity corner elbows and tee fittings, and used where required or shown on the Drawings, to maintain a controlled 2” cable bend radius which meets the specifications for Fiber Optic and UTP/STP cabling and exceeds the TIA 569 requirements for communications pathways.

2.3 SURFACE METAL RACEWAYS

A. **WIREMOLD Series V500 or V700** raceway shall be one-piece design with a base and cover factory assembled. The total width shall be 3/4” x 17/32” high with a capacity of 1.19 square inches for V500 or 3/4” x 21/32” with a capacity of 0.26 square inches for
V700. The raceway base and cover shall be a minimum thickness of 0.040”. The raceway shall be available in five (5) foot and ten (10) foot lengths.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions under which surface raceways, boxes, distribution systems, accessories, and fittings are to be installed and substrate that will support raceways. Notify the Architect/Engineer and Owner of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Surface raceways shall be installed in strict compliance with the manufacturer’s installation instructions and recommendations and approved shop drawings. Coordinate installation with adjacent work to ensure proper clearances and to prevent electrical hazards.

B. Surface raceways shall be installed parallel with or at right angles to building structure and at the mounting heights noted on Drawings.

C. Surface raceway systems shall be mechanically continuous and connected to all electrical outlets, boxes, device mounting brackets, and cabinets, in accordance with manufacturer’s installation sheets.

D. Metal raceways shall be electrically continuous and bonded in accordance with the National Electrical Code for proper grounding.

E. Surface raceway shall be supported at intervals not exceeding five (5) feet or in accordance with manufacturer’s installation sheets using appropriate anchors and screws. The use of drive pins and/or other methods using compressed air or gases are not acceptable.

1. V500 and V700 shall be supported using two (2) hole straps specifically designed for the application secured with plastic anchors and No. 6 screws.

F. Provide accessories as required for a compete installation, including insulated bushings and inserts where required by the manufacturer.

G. Close all unused raceway openings using manufacturer’s recommended accessories.

H. All surface raceway connections to outlet and/or junction boxes shall be made using adjustable offset connectors or combination connectors as detailed on the Drawings. The connectors shall be furnished by the manufacturer of the surface raceway.

I. Field cutting of surface raceways base and covers shall be accomplished by the use of the manufacturer’s raceway cutters specifically designed for this purpose.
3.3 CLEANING AND PROTECTION

A. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer.

B. Protect raceways and boxes until final acceptance by the Owner.

C. Repaint marred and scratched surfaces with touch-up paint to match original finish.

END OF SECTION
PART I - GENERAL

1.01 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE

A. The work covered under this Section shall include furnishing and installing junction and pull boxes complete for all electrical systems as shown on the Drawings and herein specified.

1.03 QUALITY ASSURANCE

A. All equipment, material, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.

B. All equipment and materials shall be listed by Underwriters Laboratories, Inc. (UL) for their intended use and shall bear the UL label.

C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.

D. Submittals are required in accordance with SECTION 16010 of these specifications.

PART 2 - PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. Junction and pull boxes shall be provided where indicated and required and shall be of the type and size for the installation of the electrical system. Junction or pull boxes not over one hundred (100) cubic inches in volume shall be constructed in accordance with the requirements of NEC. All junction boxes shall have removable screwed covers and be accessible after completion of the building. Removable covers shall not exceed three (3) feet in size in any direction and split covers shall be used for boxes larger than three (3) feet in any direction. Where several feeders pass through a common pull box, the feeders shall be tagged to indicate clearly their electrical characteristics and branch circuit numbers and panelboard designation. This same information shall be stenciled in paint on the cover of each box.

B. Pull and junction boxes shall be made of code gauge galvanized sheet steel with
removable screw covers. Minimum size shall be 4 inch x 4 inch x 2-1/8 inches deep.

C. Cast metal pull boxes shall be provided in damp or wet locations, with a gasketed screwed cover, and drilled and tapped holes as required. Screws shall be brass or bronze.

D. Pull boxes shall be provided in any conduit run which exceeds one hundred (100) feet in length, or any run having more than two hundred seventy (270) total degrees of bend.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Pull and junction boxes shall be installed where indicated on the Drawings or as herein specified. Boxes shall be located so as to be inaccessible to the general public.

B. All boxes and conductors therein shall be marked as hereinbefore specified to indicate the voltage and circuit numbers.

C. Boxes shall not be fastened in place with drive pins and/or other methods using compressed air or gases.

D. Boxes located under roof decking shall not be less than 1½ inches from the nearest surface of the roof decking.

E. Pull and junction boxes shall be concealed except in electrical and mechanical equipment rooms, spaces architecturally designed to have an open structure without ceilings or as otherwise indicated on the Drawings.

F. All system pull and junction box covers shall be painted as follows:

1. 120/208 Volt - Black
2. 277/480 Volt - Orange
3. Clocks and Program Clocks - Green
4. Emergency - White
5. Fire Alarm - Red
6. Security System - Gray
7. Sound - Blue
8. Telecommunications - Yellow
9. Cable Television/Broadband - Tan
10. Cox Communications I-NET (fiber) - Purple
3.03 CONDUCTORS

A. All conductors entering junction and pull boxes shall be of the same voltage. Do not mix voltages regardless of the conductors’ voltage rating, unless specifically shown on the Drawings.

B. Branch circuit conductors and feeder conductors shall not occupy the same junction or pull box. Maintain separate boxes for branch circuits and separate boxes for feeders, unless specifically shown otherwise on the drawings.

3.04 ARC-PROOFING

A. All feeders entering a pull box containing more than one (1) feeder, or more than one (1) parallel feeder, shall be arc-proofed as follows. Conductors of the same feeder, including each set of a parallel feeder, shall be tightly grouped together and held in place with random wrapped 3M No. 33 Tape. Grouped cables shall be arc proofed using spirally wound one half-lapped layer of 3M No. 77 Fire and Arc-Proofed Tape which shall be held in place with random wrapped 3M No. 69 Glass Cloth Electrical Tape.

END OF SECTION
PART 1 - GENERAL

1.1 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.2 SCOPE

A. The work covered under this Section shall include furnishing and installing circuit breaker type branch circuit panelboards complete for all systems as shown on the Drawings and herein specified.

1.3 QUALITY ASSURANCE

A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.

B. All equipment and materials shall be listed by Underwriter's Laboratories, Inc. (UL) for their intended use and shall bear the UL label.

C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.

D. Submittals are required in accordance with SECTION 26 05 00 of these Specifications. The manufacturer shall furnish, but not be limited to the following:

1. Circuit breaker layout with dimensions and nameplate designation.
2. Circuit breaker trip ratings and frame sizes.
3. Component list.
4. Conduit entry/exit locations.
5. Assembly ratings, including short-circuit rating, voltage, and continuous current rating.
6. Bus material, including ground bar.
7. Cable terminal sizes.
8. Product data for each type of panelboard.
1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver material and products in factory labeled packages. Store and handle in strict compliance with manufacturer’s instructions and recommendations.

B. Each panelboard section shall be delivered in individual shipping cases and individually wrapped for protection.

C. Store in a clean, dry space. Maintain factory protection and/or provide an additional heavy canvas or heavy plastic cover to protect panelboards from dirt, water, construction debris, and traffic. Where applicable, provide adequate heating within enclosures to prevent condensation.

D. Handle in accordance with NEMA PB1.1 and manufacturer’s written instructions. Handle carefully to avoid damage to panelboards internal components, enclosure and finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The branch circuit panelboards shall be as manufactured by CUTLER-HAMMER, GENERAL ELECTRIC, SIEMENS, or SQUARE D.

2.2 PANELBOARDS

A. This Contractor shall furnish and install where indicated on the Drawings, deadfront branch circuit panelboards incorporating switching and branch circuit protective devices of the number, ratings, and type noted herein or as shown on the Drawings. Branch circuit panelboards shall have NEMA 1 general purpose enclosures and shall be surface or flush mounted as noted. All branch circuit panelboards shall be rated for the intended voltage and shall be in accordance with UL's "Standard for Panelboards" and "Standard for Cabinets and Boxes" and shall be so labeled. Branch circuit panelboards shall also comply with NEMA "Standard PB1 for Panelboards" and the NEC.

B. Ratings:

1. Panelboards rated 240 Vac or less shall have short-circuit ratings as shown on the drawings, but not less than 10,000-amperes RMS symmetrical.

2. Panelboards rated 480 Vac shall have short-circuit ratings as shown on the drawings, but not less than 14,000-amperes RMS symmetrical.

C. Interiors:

1. All interiors shall be completely factory assembled with switching and protective devices, wire connectors, etc. All conductor connectors, except screw terminals, shall be of the anti-turn solderless type and all shall be suitable for copper conductors of the sizes indicated on the Drawings.
2. Interiors shall be designed so that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors and shall be so designed that circuits may be changed without matching, drilling, or tapping.

D. Branch circuits shall be arranged using double row construction except where a narrow column width panelboard is required or noted on the Drawings. Branch circuits shall be numbered by the manufacturer.

E. Furnish and install three (3), 3/4 inch and two (2), one inch empty conduits up through the wall and turned out above the ceiling; and three (3), 3/4 inch and two (2), one inch empty conduits down into the ceiling space below the floor for all flush mounted branch circuits panelboards. Where floor slab is on grade, provide only empty conduits to the ceiling.

F. All surface mounted branch circuit panelboards shall be mounted on twelve (12) gauge formed steel channel having a cross section dimension at least 1-1/2 inches x 1-1/2 inches on walls. The channel and fittings shall have a hot dipped galvanized finish to resist rust formation. Channels shall be installed vertically and as detailed on the Drawings.

G. Bus Bars:

1. Bus bars for the mains shall be of copper sized in accordance with UL 67 Standards for temperature rise to limit temperature rise on any current carrying part to a maximum of 65 degrees C above an ambient of 40 degrees C maximum. The bus bars shall be standard density rated for 1000 amperes per square inch copper. Bus bar taps for branch circuit panelboards with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Busing shall be braced throughout to conform to industry standard practice governing short circuit stresses in panelboards. Phase busing shall be full height without reduction. Cross connectors shall be copper. A non-insulated copper ground bus shall be provided for each panelboard.

2. Phase busing shall be manufactured to accept bolt-on circuit breakers only.

3. Spaces for the addition of future switching and protective devices in branch circuit panelboards shall be bussed for the maximum number of devices possible complete with pre-drilled mounting holes and knockouts in the front cover.

4. A non-insulated copper ground bus shall be provided for each branch circuit panelboard.

5. Full size (100% rated) insulated neutral bussing shall be included for panelboards shown with a neutral. Neutral bussing shall have a suitable lug for each outgoing feeder or branch circuit requiring a neutral connection.

6. Lugs shall be rated for 75 degrees C terminations and shall bolt in place.
H. Backboxes:

1. Backboxes shall be made from unpainted galvanized code gauge steel having no knockouts.

2. Boxes shall have gutter and wiring space sized as required per NEC but not less than four (4) inches on all sides. Where feeder cables supplying the mains of a panelboard are carried through the box to supply other electrical equipment, the box shall be so sized as to include this wiring space. This wiring space shall be in addition to the minimum gutter space specified above and the limiting width may be increased accordingly.

3. Backboxes shall also have sufficient space to safely attach clamp-on or split-core current transformers to the feeders for future portable or permanent check metering.

4. Backboxes for multiple (two or more) sections shall be of the same dimensions.

5. Each backbox shall include at least four (4) interior mounting studs.

6. The branch circuit panelboard identification number shall be on the backbox.

7. Branch circuit panelboard backboxes shall be of one (1) piece construction.

I. Trim:

1. Hinged doors shall be the door-in-door type covering all switching device handles and all live parts and shall be included in all branch circuit panelboard trims. The use of door in a hinged cover type panelboard is prohibited.

2. Doors in branch circuit panelboard trims shall conform to the following:

   a. In making device handles accessible, inboard doors shall not uncover any live parts. Outboard doors shall allow hinged access to the interior panel wiring without removal of the panel door assembly.

   b. Doors shall have a semi-flush type cylinder lock and catch. Door hinges shall be concealed. Two (2) keys shall be furnished for each panelboard door and all locks shall be keyed as requested by the Owner to match current standard. The outer door shall be keyed separately. Directory frame and card, having a transparent cover, shall be furnished on the inside of each door.

   c. Directory cards shall be neatly typewritten indicating each branch circuit number and assignment. The assignment designation shall include the final room number(s) assigned by the Owner. Do not use the architectural room numbers shown on the Drawings. The director cards shall also include the source (switchboard, panelboard, etc. with circuit number) feeding the panel.
3. The trims shall be fabricated from code gauge sheet steel.

4. All of the panelboard's steel surfaces, exterior and interior shall be properly cleaned and finished with the manufacturer's standard paint over a rust-inhibiting phosphatized coating. The finish paint shall be of a type to which field applied paint will adhere.

5. Trims for flush mounted branch circuit panelboards shall overlap the box by at least 3/4 inches on all sides. Surface trims shall be mountable by a screwdriver without the need for special tools.

J. Conduit skirts shall be provided on surface mounted branch circuit panelboards, where shown on the drawings. Skirts shall be the same width and depth as the panelboard backbox. Screw on skirt covers shall be the same code gauge sheet steel as the panelboard trim and painted with the same finish and color as the panelboard. Skirts shall be from the top of the panelboard to the underside of the finished ceiling and/or from the bottom of the panelboard to the finished floor concealing all conduits.

2.3 CIRCUIT BREAKERS

A. Electrical circuits shall be protected by molded case circuit breakers as indicated on the Drawings.

B. The circuit breakers shall be operated by a toggle type handle and shall have a quick-make, quick-break over-center switching mechanism that shall be mechanically trip free from the handle so that the contacts cannot be held closed against short circuits and abnormal currents. Tripping due to overload or short circuit shall be clearly indicated by the handle automatically assuming a position midway between the manual "ON" and "OFF" positions. All latch surfaces shall be ground and polished. All poles of a multi-pole breaker shall be so constructed that they open, close, and trip simultaneously.

C. The circuit breakers shall be completely enclosed in a molded case. Non-interchangeable trip breakers shall have their covers sealed; interchangeable trip breakers shall have the trip unit sealed to prevent tampering. Ampere ratings shall be clearly visible. Contacts shall be non-welding silver alloy. Arc extinction shall be accomplished by means of arc chutes consisting of metal grids mounted in an insulating support. Breakers shall be of the bolt-on type; plug-in, plug-on, blow-on, and clamp-on circuit breakers shall not be acceptable.

D. Circuit breakers shall be 80% rated unless indicated on the Drawings to be 100% rated.

E. Circuit breakers shall have a minimum symmetrical interrupting capacity as indicated on the Drawings. The interrupting ratings of the circuit breakers shall be at least equal to, or greater than, the available short circuit at the line terminals and not less than those values shown on the Drawings and specified in this specification section.

F. Circuit breakers shall be listed with UL, conform to the applicable requirements of the latest issue of NEMA Standards Publication No. AB1.
G. Circuit breakers shall have thermal-magnetic trip units, with inverse time-current characteristics, unless otherwise noted on the Drawings and/or specified herein.

1. Automatic operation of all circuit breakers shall be obtained by means of thermal-magnetic tripping devices located in each pole providing inverse time delay and instantaneous circuit protection. Instantaneous pick-up settings for each phase shall be adjustable on all frames 250A and above.

2. Circuit breakers shall be ambient compensating in that, as the ambient temperature increases over 40°C, the circuit breaker automatically derates itself to better protect its associated conductor.

3. Circuit breakers 250A and above shall have thermal magnetic interchangeable trip units,

H. Circuit breaker frames 400 ampere and above shall have microprocessor-based RMS sensing trip units on 480 volt systems and on 208 volt systems where indicated on the Drawings.

1. Solid State sensing shall measure true RMS current with capability to measure through to the 21st harmonic. Automatic operation of all circuit breakers shall be obtained by means of solid state tripping elements providing inverse time delay and instantaneous and short-time circuit protection. Continuous current rating shall be adjustable from 20% to 100% of trip unit rating. Long-time delay and instantaneous trip ratings shall also be adjustable. The short time pick-up trip shall have adjustable pick-up settings at definite times and with I2t delay.

2. Long time current adjustment shall be possible without the need for a rating plug.

3. Main and feeder circuit breakers shall be provided with integral ground fault protection in 480 volt panels. Ground fault pick-up shall be adjustable from 20% to 70% of the breakers maximum continuous current rating, but in no case be greater than 1200A. Ground fault time delay shall be adjustable with three (3) I2t delay settings.

4. Solid State circuit breakers shall have built-in test ports for testing the long-time delay, instantaneous, and ground fault functions (if equipped) of the breaker by means of a test set.

5. Provide one test set capable of testing all circuit breakers with a built-in test port, unless previously provided under another section of these specifications.

I. Circuit breaker accessories: Provide shunt trips, bell alarms and auxiliary switches, etc. as may be shown on the drawings. All accessories shall be UL Listed for field installation.

J. Circuit breakers shall be manufactured by the same manufacturer as the panelboard and factory installed.
2.4 MULTIPLE SECTION PANELBOARDS

A. Panelboards with two (2) or more panelboard sections, sub-feed lugs or thru-feed lugs shall be used in all but one (1) section of each panelboard, unless otherwise shown on the Drawings. Lugs shall have same capacity as incoming mains. Cable interconnections shall be field installed.

2.5 NAMEPLATES

A. Branch circuit panelboards shall have nameplates of 1/16 inch thick laminated plastic with 3/16 inch high white letters on a black background. Nameplates shall identify the branch circuit panelboard and shall be mounted on the front top of the enclosure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Before installing branch circuit panelboards, this Contractor shall check all of the Drawings for possible conflict of space and adjust the location of the branch circuit panelboard to prevent such conflict with other items. Panelboard locations in electrical rooms and other spaces shall closely follow the layouts shown on the Drawings, leaving sufficient space on walls for future installations of panelboards and/or other electrical equipment.

B. Surface mounted branch circuit panelboards shall be securely mounted to steel framing channel at locations shown on Drawings. Construction shall be such that additional conduits can be added for future requirements.

C. The cabinets and enclosures shall be mounted in accordance with the NEC. This Contractor shall furnish all materials necessary for mounting the branch circuit panelboards.

D. Install units plumb, level and rigid without distortion to the branch circuit panelboard.

E. Branch circuit panelboard interiors shall be factory assembled with circuit breakers, wire connectors, etc. Circuit breakers shall be sequence numbered to correspond with the panelboard directory.

F. Connect the SPD to the appropriate circuit breaker.

G. Contractor shall install required safety labels.

H. The mounting of junction boxes, wire troughs, and auxiliary gutters to the top, bottom or sides of a branch circuit panelboard is prohibited unless approved by the FCPS technical inspection staff on a case by case basis.
3.2 FIELD TESTS

A.  Check tightness of all accessible mechanical and electrical connections to assure they are torqued to the minimum acceptable manufacturer’s recommendations.

B.  Check all panelboards for proper grounding, fastening and alignment.

3.3 FIELD ADJUSTMENTS

A.  This Contractor shall perform field adjustments of the protective devices as required to place the equipment in final operating condition. Necessary field settings of devices and adjustments and minor modifications to equipment shall be carried out by this Contractor at no additional cost to the Owner.

3.4 CLEANING

A.  Remove debris from panelboards and wipe dust and dirt from all components.

B.  Repaint marred and scratched surfaces with touch-up paint to match original finish.

3.5 EXISTING BRANCH CIRCUIT PANELBOARDS

A.  This Contractor shall clean, adjust, and tighten all feeder and branch circuit connections (new and existing) and provide new typewritten directories (as described above) in all existing branch circuit panelboards that are associated with work on this project. Panelboard’s not associated with work on this project are not subject to this requirement.

END OF SECTION
PART 1 - GENERAL

1.1 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.2 SCOPE

A. The work covered under this Section shall include furnishing and installing wiring devices, for all electrical systems as shown on the Drawings and herein specified.

1.3 QUALITY ASSURANCE

A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements and these Specifications.

B. All equipment and materials shall be listed by Underwriters Laboratories, Inc. (UL) for their intended use and shall bear the UL Label.

C. All 125 volt and 250 volt, 15 amp and 20 amp receptacles (NEMA 5-15R, 5-20R, 6-15R, 6-20R, L5-15R, and L5-20R) shall be FSUL WC-596-G compliant and bear the FSUL label.

D. All non-locking 125 volt and 250 volt, 15 amp and 20 amp receptacles (NEMA 5-15R, 5-20R, 6-15R and 6-20R) located in damp or wet locations shall be UL Listed as “weather resistant”.

E. All lighting switches shall be FSUL WS-896 compliant and bear the FSUL label.

F. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.

G. Submittals are required in accordance with SECTION 26 05 00 of these Specifications.

1. Certain wiring devices and other equipment listed hereinafter may not be part of this project. This Contractor shall select from the listed devices the equipment necessary to be compliant with the Contract Documents and include in the submittals only the devices and equipment specific for this project.
# PART 2 - PRODUCTS

## 2.1 LIGHTING SWITCHES

A. Lighting switches shall be manufactured by PASS & SEYMOUR (P&S) as listed below or the equivalent as manufactured by COOPER (ARROW HART), HUBBELL, or LEVITON.

B. Lighting switches shall be totally enclosed, 20 amp, 120-277 volt with screw-type wire terminals to accept No. 14 through No. 10 AWG solid copper conductors, ivory thermoplastic toggle, and grounding terminal, or Plug Tail Type. All locking type switches shall be keyed alike. Lighting switches shall be as follows:

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Single pole P&amp;S Cat. No. PS20AC1I</td>
</tr>
<tr>
<td>2.</td>
<td>Single Pole (PlugTail Type) PT20AC1I</td>
</tr>
<tr>
<td>3.</td>
<td>Single pole, locking type P&amp;S Cat. No. PS20AC1IL</td>
</tr>
<tr>
<td>4.</td>
<td>Single pole, double throw-Two circuit, center off P&amp;S Cat. No. 1221I</td>
</tr>
<tr>
<td>5.</td>
<td>Three-way P&amp;S Cat. No. PS20AC3I</td>
</tr>
<tr>
<td>6.</td>
<td>Three-way (PlugTail Type) PT20AC3I</td>
</tr>
<tr>
<td>7.</td>
<td>Three-way, locking type P&amp;S Cat. No. PS20AC3IL</td>
</tr>
<tr>
<td>8.</td>
<td>Four-way P&amp;S Cat. No. PS20AC4I</td>
</tr>
<tr>
<td>9.</td>
<td>Four-way, locking type P&amp;S Cat. No. PS20AC4IL</td>
</tr>
<tr>
<td>10.</td>
<td>Momentary contact P&amp;S Cat. No. 1251I</td>
</tr>
<tr>
<td>11.</td>
<td>Momentary contact, locking type P&amp;S Cat. No. 1251L</td>
</tr>
</tbody>
</table>

C. All PlugTail lighting switches shall come complete minimum six (6) inch solid THHN Connector. Stranded connectors shall not be acceptable.

D. Pilot lighting switches shall be totally enclosed, 20 amp, 120 volt and 277 volt with screw type wire terminals to accept No. 14 through No. 10 AWG solid copper conductors, red “lighted when ON” lighted toggle, and grounding terminal. Pilot lighted switches shall be as follows:

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Single pole (120V) P&amp;S Cat. No. PS20AC1RPL</td>
</tr>
<tr>
<td>2.</td>
<td>Single pole (277V) P&amp;S Cat. No. PS20AC1RPL7</td>
</tr>
<tr>
<td>3.</td>
<td>Three-way (120V) P&amp;S Cat. No. PS20AC3RPL</td>
</tr>
<tr>
<td>4.</td>
<td>Three-way (277V) P&amp;S Cat. No. PS20AC3RPL7</td>
</tr>
</tbody>
</table>
E. Wall switch occupancy sensors are specified under Specification SECTION 26 59 24.

2.2 MOTOR SWITCHES

A. Motor switches shall be totally enclosed, 30 amp, 600 volt with screw-type wire terminals to accept solid copper conductors and a grounding terminal. Motor switches shall be as follows:

1. Single phase, Double pole P&S Cat. No. 7802MD
2. Three phase, Three pole P&S Cat. No. 7803MD

B. Motor switches shall include a red pilot light with the switch or on a separate mounting strap in a two gang outlet box and suitable coverplate. Pilot light shall glow red when switch is ON. Pilot lights shall be suitable for the voltage supplied to the motor switch. Pilot light on a separate mounting strap shall be P&S Cat. No. 2151RED or approved equal.

C. Mechanical door limit switches shall be Mars Corporation Part No. 99-014 – 250 volt, 1 phase, 20 amp, 1 HP max or approved equal.

2.3 RECEPTACLES

A. Receptacles shall be manufactured by PASS & SEYMOUR (P&S) as listed below or the equivalent as manufactured by COOPER (ARROW HART), HUBBELL, or LEVITON.

B. All straight blade 15A and 20A receptacles shall be tamper-resistant type.

C. Receptacles shall be of the types listed below, complete with an impact resistant nylon face, screw type wire terminals to accept copper conductors, high strength thermoplastic back body, and grounding terminal, or Plug Tail Type.

1. Duplex 2P, 3W, 20A, 125V, NEMA 5-20R: P&S Cat. No. 5362-AI
2. Duplex (PlugTail Type), 2P, 3W, 20A, 125V, NEMA 5-20R: P&S Cat. No. PT5362-AI
4. Controlled Receptacle (PlugTail Type), Duplex 2P, 3W, 20A, 125V, NEMA 5-20R: P&S Cat. No. PT5362-AGRY
5. Duplex 2P, 3W, 20A, 125V, NEMA 5-20R Tamper-Resistant (safety) type with two USB Charging Ports: P&S Cat. No. TR5362USB1
4. Duplex 2P, 3W, 20A, 125V, NEMA 5-20R
   Weather-Resistant:
   P&S Cat. No. WR5362I

5. Duplex 2P, 3W, 20A, 125V, NEMA 5-20R
   Ground Fault Circuit Interrupter type with Safe Lock:
   P&S Cat. No. 2095I

6. Duplex (Plugtail Type) 2P, 3W, 20A, 125V, NEMA 5-20R
   Ground Fault Circuit Interrupter type with Safe Lock:
   P&S Cat. No. PT2095I

7. Duplex 2P, 3W, 20A, 125V, NEMA 5-20R
   Connected to an emergency circuit:
   P&S Cat. No. 5362-ARED

8. Duplex (Plugtail Type) 2P, 3W, 20A, 125V, NEMA 5-20R
   Connected to an emergency circuit:
   P&S Cat. No. PT5362-ARED

   Tamper-Resistant (safety) type:
   P&S Cat. No. TR63I

10. Duplex (PlugTail Type), 2P, 3W, 20A, 125V, NEMA 5-20R
    Tamper-Resistant (safety) type:
    P&S Cat. No. PTTR63I

11. Controlled Receptacle, Duplex 2P, 3W, 20A, 125V, NEMA 5-20R
    Tamper-Resistant (safety) type:
    P&S Cat. No. TR63GRY

12. Controlled Receptacle Duplex (PlugTail Type), 2P, 3W, 20A, 125V, NEMA 5-
    20R, Tamper-Resistant (safety) type:
    P&S Cat. No. PTTR63I

    Tamper-Resistant (safety), Ground Fault Circuit Interrupter type with
    Safe Lock:
    P&S Cat. No. 2095TRI

    Tamper-Resistant (safety), Ground Fault Circuit Interrupter type with
    Safe Lock:
    P&S Cat. No. PT2095TRI
15. Duplex 2P, 3W, 20A, 125V, NEMA 5-20R
   Weather-Resistant and Tamper-Resistant, Ground Fault Circuit Interrupter type
   with Safe Lock:
P&S Cat. No. 2095TRWRI

16. Single 2P, 3W, 20A, 125V, NEMA 5-20R connector:
P&S Cat. No. 5369-X

17. Single 2P, 3W, 15A, 125V, NEMA L5-15R:
P&S Cat. No. 4710

18. Single 2P, 3W, 20A, 125V, NEMA L5-20R:
P&S Cat. No. L520R

19. Single 2P, 3W, 20A, 125V, NEMA L5-20R connector:
P&S Cat. No. L520C

20. Single 2P, 3W, 30A, 125V, NEMA 5-30R:
P&S Cat. No. 3802

21. Single 2P, 3W, 30A, 125V, NEMA L5-30R:
P&S Cat. No. L530R

22. Single 2P, 3W, 15A, 250V, NEMA 6-15R:
P&S Cat. No. 5662AI

23. Single 2P, 3W, 20A, 250V, NEMA 6-20R:
P&S Cat. No. 5862AI

24. Single 2P, 3W, 30A, 250V, NEMA 6-30R:
P&S Cat. No. 3801

25. Single 2P, 3W, 50A, 250V, NEMA 6-50R:
P&S Cat. No. 3804

26. Single 3P, 4W, 20A, 125/250V, NEMA 14-20R:
P&S Cat. No. 3820

27. Single 3P, 4W, 30A, 125/250V, NEMA 14-30R:
P&S Cat. No. 3864

28. Single 3P, 4W, 50A, 125/250V, NEMA 14-50R:
P&S Cat. No. 3894
29. Single 3P, 4W, 60A, 125/250V, NEMA 14-60R:
P&S Cat. No. 3871

30. Single 3P, 4W, 20A, 250V, NEMA 15-20R:
P&S Cat. No. 3821

31. Single 3P, 4W, 30A, 250V, NEMA 15-30R:
P&S Cat. No. 5740

32. Single 3P, 4W, 50A, 250V, NEMA 15-50R:
P&S Cat. No. 5750

33. Single 3P, 4W, 60A, 250V, NEMA 15-60R:
P&S Cat. No. 5760

34. Single 3P, 4W, 50A, 125/250V P&S Cat. No. CS6369.

Wireless Clock Outlet with stainless steel cover plate:
P&S Cat. No. S3733-SS

D. Wiring devices mounted in WIREMOLD V4000 surface metal raceways shall be ivory or light almond in color to match the raceway in lieu of the colors indicated above, except red wiring devices shall not change.

E. All PlugTail receptacles shall come complete minimum six (6) inch solid THHN Connector. Stranded connectors shall not be acceptable.

2.4 COVER PLATES

A. A cover plate shall be furnished and installed over each wiring device. Plates shall be PASS & SEYMOUR Type 302 (non-magnetic) stainless steel with satin finish, 0.032" nominal thickness or the equivalent as manufactured by COOPER (ARROW HART), HUBBELL, LEVITON or MULBERRY. All cover plates shall be UL listed.

1. Wall switch occupancy sensors shall have stainless steel cover plates, not the plastic cover plates that may be included in the switch packaging.

B. Cover plates shall be of a configuration to match the type of wiring device to be covered. Where more than one flush outlet (switch, receptacle, etc.) is indicated in the same location and at the same mounting height, all (except dimmer switches) shall be ganged in a single multi-gang outlet box under a common cover plate.

C. Wiring devices located in wet or damp locations, or noted "WP" on the Drawings shall be complete with a die-cast weatherproof metallic cover plate. Receptacles in damp locations only, may use this type of weatherproof cover plate. All weatherproof cover plates shall be UL listed.
D. All 15 amp and 20 amp receptacle type wiring devices located in wet locations, or noted “WP” on the Drawings, shall have hinged weatherproof “while-in-use” covers. Other receptacle type wiring devices located in wet and damp locations where equipment is intended to be plugged into it and not attended while in use shall also have hinged weatherproof “while-in-use” covers. Provide these types of weatherproof covers at other locations identified on the Drawings. Covers, body and plates shall be gray die-cast aluminum, fully gasketed and suitable for mounting horizontally and vertically. Mounting screws shall be 302 stainless steel. Cover assembly shall be UL listed.

E. All receptacles on an emergency circuit shall have a coverplate, PASS & SEYMOUR Type 302 (non-magnetic), labeled with 1/8” high engraved and filled lettering “EMERGENCY”.

F. Cover plates for receptacles for all classrooms and instructional spaces shall be labeled with the circuit number including panelboard designations. Labeling shall be done with a BROTHER® Model No. PT-1400 (P-touch) professional label maker, or approved equal, using a laminated type extra strength adhesive tape, Letters/numerals shall be black with a white background, minimum 3/16” high.

G. Cover plates for lighting control digital switches shall be labeled with the lighting control panel designation and room number designation or as shown on the Drawings. Labeling shall be done with a BROTHER® Model No. PT-1400 (P-touch) professional label maker, or approved equal, using a laminated type extra strength adhesive tape, Letters/numerals shall be black with a white background, minimum 3/16” high.

PART 3 - EXECUTION

3.1 WIRING DEVICES

A. This Contractor shall furnish and install all wiring devices, material, and hardware as indicated on the Drawings, as specified, or as required for a complete installation.

B. Before installation, the exact type of wiring devices shall be coordinated with all associated trades.

C. This Contractor shall check all wiring devices for damages during construction and replace where necessary. All devices shall be cleaned and left in a complete operable condition.

D. This Contractor shall verify all door swings before installing lighting switches.

E. Receptacles shall be installed only on clear wall spaces, not in tackboards, chalkboards, pipe chases, mechanical equipment, or built-in type furniture and cabinets. If receptacles are shown on the Drawings to be installed therein, this Contractor shall call it to the attention of the Architect/Engineer and obtain a new location.
F. Dimmer switches shall not be ganged together with other types of lighting switches. Multiple dimmer switches shall be ganged together using the number of outlet boxes and/or outlet box gangs in accordance with the manufacturer’s instructions.

3.2 POWER OUTLET PANELS

A. All mounting openings not used must be permanently sealed to keep rain, moisture, insects, etc. from entering the box housing. The use of stainless steel screws/nuts with rubber washers and silicone sealant may be used, or another approved method for a completely sealed box housing.

3.3 CONNECTIONS

A. Ground equipment according to Specification Section 26 05 26 “Grounding” and the National Electrical Code.

B. Connect wiring according to Specification Section 26 05 09 “Wire, Cables, and Connectors”.

C. Tighten electrical connections and terminals according to manufacturer’s published torque-tightening values. If manufacturer’s torque values are not indicated, use those specified in UL 486A/B.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections:

1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.

2. Test GFCI operation with both local and remote fault simulations according to manufacturer’s written instructions.

B. Remove malfunctioning units, replace with new units, and retest as hereinbefore specified.

END OF SECTION
SECTION 262816
DISCONNECT SWITCHES

PART 1 - GENERAL

1.01 REQUIREMENTS
   A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE
   A. The work under this Section shall include furnishing and installing safety switches and/or bolted pressure switches as shown on the Drawings and herein specified.

1.03 QUALITY ASSURANCE
   A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.
   B. All equipment and materials shall be listed by Underwriter's Laboratories, Inc. (UL) for their intended use and shall bear the UL label.
   C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.
   D. Submittals are required in accordance with SECTION 16010 of these Specifications.

PART 2 - PRODUCTS

2.01 SAFETY SWITCHES
   A. This Contractor shall furnish and install where shown on the Drawings, heavy-duty type safety switches. Safety switches shall be NEMA heavy-duty type HD only and shall be UL listed. The heavy-duty safety switches shall be manufactured by CUTLER-HAMMER, GENERAL ELECTRIC or SIEMENS.
   B. Switches shall have a quick-make and quick-break operating handle and mechanism that shall be an integral part of the enclosure. Switches shall be horsepower rated 250 volt for 120/208 volt systems or 600 volt for 277/480 volt system. The lugs shall be UL listed for copper conductors and be front removable. Ampere ratings shall be as indicated on the Drawings.
   C. Safety switches required and/or noted on the Drawings to be "four wire" shall be furnished by the manufacturer complete with a solid neutral assembly.
D. Safety switches shall have defectable door interlocks that prevent the door from opening when the handle is in the “ON” position. Defeater mechanism shall be front accessible.

E. Enclosures for the switches shall generally be NEMA 1 or NEMA 3R (rainproof) for exterior locations, or where noted "WP" on the Drawings.

2.03 NAMEPLATE

A. Disconnect switches, including exterior locations, shall have nameplates of 1/16 inch thick laminated plastic with 3/16 inch high white letters on a black background. Nameplates shall identify each piece of equipment and shall be mounted on the front top of the enclosure. Nameplates shall be screw fastened using stainless steel screws.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The disconnect switches shall be securely mounted in accordance with the NEC, approximately forty eight (48) inches but no less than twelve (12) inches above the finished floor to the bottom unless otherwise noted.

B. Mounting brackets and hardware exposed to weather shall be galvanized or otherwise suitably protected from corrosion.

1. All NEMA 3R disconnect safety switches mounting openings not used must be permanently sealed to keep rain, moisture, insects, etc. from entering the switch housing. The use of stainless steel screws/nuts with rubber washers and silicone sealant may be used, or another approved method for a completely sealed switch housing.

B. The fuses (type and size as noted on the Drawings) as specified shall be installed in disconnect switches requiring fuses. Rejection fuse clips shall be installed where called for on the Drawings or in these Specifications.

C. Contractor shall install required safety labels.

END OF SECTION
PART 1 - GENERAL

1.01 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE

A. The work under this Section shall include furnishing and installing Surge Protective Devices (SPDs), formerly TVSS, for the protection of AC electrical circuits as shown on the Drawings and herein specified.

1.03 QUALITY ASSURANCE

A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.

B. SPD units and all components shall be designed, manufactured and tested in accordance with the most recent editions of ANSI/UL 1449 and UL 1283.

C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards (NEMA LS-1).

D. Submittals are required in accordance with SECTION 16010 of these Specifications. The submittals shall contain, at a minimum, the following:

1. Provide verification that the SPD complies with the required ANSI/UL 1449 3rd Edition listing by Underwriters Laboratories (UL) or other Nationally Recognized Testing Laboratory (NRTL) acceptable to Fairfax County Department of Public Works and Environmental Services. Compliance may be in the form of a file number that can be verified on UL’s website or on any other NRTL’s website, as long as the website contains the following information at a minimum: model number, SPD Type, system voltage, phases, modes of protection, Short Circuit Current Rating (SCCR), Voltage Protection Ratings (VPRs) for all modes, Maximum Continuous Operating Voltage rating (MCOV) and Nominal Discharge Current ($I_n$). UL data and visual inspection takes precedence over manufacturer’s published documentation.

2. For SPD external mounting applications include electrical/mechanical drawings showing unit dimensions, weights, installation instruction details, and wiring configuration.
3. Where applicable the following additional information shall be included in the submittals:
   a. Descriptive bulletins.
   b. Product sheets.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance, the following SPD manufacturers are acceptable: ADVANCED PROTECTION TECHNOLOGIES (APT) as listed herein or TOTAL PROTECTION SOLUTIONS (TPS) or SURGE SUPPRESSION INC or the switchboard manufacturers SPD’s for internal or external mounting in or on switchboards shall also be acceptable. Panelboard manufacturers SPD’s for external mounting only shall also be acceptable.

B. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features, and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety.

2.02 VOLTAGE SURGE SUPPRESSION – GENERAL

A. Electrical Requirements:

1. Refer to Drawings for operating voltages and unit configurations.

2. SPD’s shall be UL labeled with 200kA Short Circuit Current Rating (SCCR). Fuse ratings shall not be considered in lieu of demonstrated withstand testing SPDs.

3. Maximum Continuous Operating Voltage (MCOV):

<table>
<thead>
<tr>
<th>System Voltage</th>
<th>Allowable System Voltage Fluctuation (%)</th>
<th>MCOV</th>
</tr>
</thead>
<tbody>
<tr>
<td>208Y/120</td>
<td>25%</td>
<td>150V</td>
</tr>
<tr>
<td>480Y/277</td>
<td>15%</td>
<td>320V</td>
</tr>
</tbody>
</table>

4. The suppression system shall incorporate thermally protected metal-oxide varistors (MOV's) as the core surge suppression component for the service entrance and all other distribution levels. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards.

5. The SPD shall provide surge current path for all modes of protection: L-N, L-G, and N-G for Wye systems; L-L, L-G in Delta and impedance grounded Wye systems.

6. All SPD’s applied to the distribution system shall have a 20kA Nominal Discharge Current (Iₚ) rating regardless of their SPD Type (includes Types 1
and 2) or operating voltage. SPDs having an \( I_n \) less than 20kA shall not be acceptable.

7. ANSI/UL 1449 Listed Voltage Protection Ratings (VPRs) shall not exceed the following:

<table>
<thead>
<tr>
<th>System Voltage</th>
<th>L-N</th>
<th>L-G</th>
<th>L-L</th>
<th>N-G</th>
</tr>
</thead>
<tbody>
<tr>
<td>208Y/120</td>
<td>800V</td>
<td>800V</td>
<td>1200V</td>
<td>800V</td>
</tr>
<tr>
<td>480Y/277</td>
<td>1200V</td>
<td>1200V</td>
<td>2000V</td>
<td>1200V</td>
</tr>
</tbody>
</table>

(Numerically lower is allowed/preferred; old-style Suppressed Voltage Ratings (SVRs) shall not be submitted, nor evaluated due to outdated less-strenuous testing).

B. SPD Design:

1. SPD shall be UL listed Type 1 or Type 2, intended for use without need for external or supplemental overcurrent controls. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal over temperature controls. SPD’s relaying upon external or supplementary installed safety disconnects do not meet the intent of this specification.

2. The SPD shall be maintenance free and shall not require any user intervention throughout its life. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.

3. The surge current shall be equally distributed to all MOV components to ensure equal stressing and maximum performance. The surge suppression platform must provide equal impedance paths to each matched MOV. Designs incorporating replaceable SPD modules shall not be accepted.

4. SPD shall have UL 1283 EMI/RFI filtering with minimum attenuation of 50dB at 100kHz.

5. SPD shall include visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED. SPD shall include an audible alarm with on/off silence function and diagnostic test function. SPDs for branch circuit panels not employing an on/off silence function will be acceptable.

6. The SPD must include Form C dry contacts (one NO and one NC) for remote monitoring of its status. Both the NO and NC contacts shall change state under any fault condition or if power is removed from the SPD. Service entrance locations shall have two sets of NO and NC contacts for building power monitoring.
7. SPDs at service entrance locations shall be provided with a surge event counter with a reset button allowing the surge counter to be zeroed. The surge event count shall have a lithium battery backup or be stored in non-volatile memory and displayed after power is restored.

8. Internally mounted SPDs in switchboards shall be designed to interface with the electrical assembly via factory installed conductors only and not mounted directly to bus bars.

9. Sidemount SPDs shall be factory sealed in order to prevent access to the inside of the unit. Sidemount SPDs shall have factory installed phase, neutral, ground and remote status contact conductors factory installed and shall have a pigtail of conductors protruding outside of the enclosure for field installation. Top mount SPDs for switchboards where sidemount is not feasible due to space constrictions or space allowed for future expansion.

C. SPDs shall have NEMA 1 general purpose enclosures, unless otherwise noted or required for the environment. SPDs located in kitchens or other areas subject to possible water exposure shall be NEMA 4X.

2.03 SYSTEM APPLICATION

A. The SPD applications covered under this section include switchboard assemblies, motor control centers (if present), distribution and branch circuit panelboards. All SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C, B, and A environments.

B. The minimum current capability (single pulse rated) per phase shall be:

- Service Entrance or Automatic Transfer Switch: 250kA
- Distribution Panelboards & MCC: 150kA
- Branch Circuit Panelboards: 100kA

C. SPDs installed on the load side of the service entrance disconnect shall be Type 1. Other SPD locations beyond the service entrance shall be Type 1 or Type 2.

2.05 POWER DISTRIBUTION AND BRANCH CIRCUIT PANELBOARD LOCATIONS

A. The SPD application covered under this section includes distribution and branch circuit panelboards. The SPD units shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category B environments.

B. The SPD shall be mounted externally and adjacent to the panelboard. The SPD shall be connected through a three pole, 30A circuit breaker to serve as the disconnecting means for the SPD. Connections shall be made via conductors originating in the SPD and shall be kept as short as possible.

C. SPDs shall be flush mounted adjacent flush mounted panelboards and surface mounted adjacent to or attached to surface mounted panelboards.
The external SPD shall be ADVANCED PROTECTION TECHNOLOGIES (APT) Model No.: [Engineer to edit]
- TE02XDS154XA for 120/208V distribution panelboards
- TE04XDS154XA for 277/480V distribution panelboards
- TE02XDS104XA for 120/208V branch circuit panelboards
- TE04XDS104XA for 277/480V branch circuit panelboards

SPDs for motor control centers (MCC) shall be from the same manufacturer as the MCC. The SPD shall be internal and panel mounted in the front face of the MCC at the assembly point by the original equipment manufacturer. Alternatively, the SPD from the same or different manufacturer may be mounted external to the MCC. All monitoring and diagnostic features shall be visible from the front of the equipment. [Engineer edit out if not using MCCs]

PART 3 - EXECUTION

3.01 INSTALLATION

A. SPD shall be installed per manufacturer’s installation instructions with lead lengths as short (less than 24”) and straight as possible. Gently twist conductors together.

B. This Contractor may reasonably rearrange the circuit breaker locations to ensure the shortest and straightest possible leads for the SPD connections.

C. Before energizing, this Contractor shall verify service and separately derived system neutral to ground bonding jumpers per the National Electrical Code.

D. Repaint marred and scratched surfaces with touch-up paint to match original finish.

3.02 TRAINING

A. This Contractor shall provide four (4) hours of technical service training to the Owner’s technical and maintenance staff.

B. The training session shall be conducted by a manufacturer’s qualified representative. The training program shall consist of instruction on operation of the assembly.

3.03 WARRANTY

A. SPDs and supporting components and accessories shall be guaranteed by the manufacturer to be free of defects in material and workmanship for a period of ten (10) years from the date of substantial completion of service and activation of the system to which the suppressor is attached. Additionally, during the applicable warranty period, and SPD which fails due to any electrical anomaly, including lightning, shall be replaced by the manufacturer without charge. Special or optional warranties in excess of the warranty period for purposes of this bid are not acceptable. Standard unit warranties in
excess of the warranty period stated herein are acceptable. Refer to SECTION 01740 for the start of the warranty period.

B. Since “Acts of Nature” or similar statements typically include the threat of lightning to which the SPDs shall be exposed, any such clause limiting warranty responsibility in the general conditions of this specification shall not apply to this particular section. The warranty must specifically provide for unlimited free replacements of the SPD in the event of failure caused by the effects of lightning and all other electrical anomalies. The warranty shall cover the entire device, not just various components, such as modules only.

END OF SECTION
SECTION 26 51 19

INTERIOR L.E.D. AND EXIT LIGHTING

PART 1 - GENERAL

1.1 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.2 SCOPE

A. The work covered under this Section shall include furnishing and installing light-emitting diode (L.E.D.) luminaires (lighting fixtures) complete as shown on the Drawings, as described in the “Luminaire (Lighting Fixture) Schedule”, and as herein specified.

1.3 QUALITY ASSURANCE

A. This contractor shall provide luminaires that are of a manufacturer engaged in the production of luminaires that are equal in material, design and workmanship. The manufacturer’s luminaire shall have been in satisfactory commercial or industrial use for a minimum of three (3) years. The manufacturer’s luminaire shall have been available on the commercial market during the three (3) year period.

B. L.E.D. luminaires shall conform to the requirements of the National Electrical Code (NEC), state and local codes, and these Specifications.

C. The luminaires shall be listed by Underwriters Laboratories, Inc. (UL) or listed by a nationally recognized testing laboratory acceptable to Fairfax County DPWES.

D. Submittals are required in accordance with SECTION 26 05 00 of these Specifications.

1.4 DESCRIPTION

A. This Contractor shall furnish, assemble, and install L.E.D. luminaires complete with sockets, louvers, lenses, internal wiring, leads, trims, rings, frames, hangers, straps, reflectors, light engine, and power supply unit (driver) as applicable and required for a complete installation.

B. Luminaires that require remote mounting of any components needed for its operation, such as drivers, or light engine electronics are not permitted. All components needed to make the luminaire operational shall be integral to the luminaire housing.
1.5 WARRANTY

A. This Contractor shall deliver the work described herein in a first class operating condition in every respect. This Contractor shall also warrant that the material and workmanship shall be entirely free from defects. Any materials, equipment, or workmanship in which defects may develop before or during the warranty period shall be repaired or replaced at the Contractors own expense. Refer to SECTION 01 74 00 for the start of the warranty period. The contractor shall further warrant that all material, equipment, and workmanship used in the installation, but not specifically mentioned in the Drawings and Specifications, is the best of their respective kinds and that the construction and installation was performed in accordance with the best accepted standard practices in all details. Lighting fixture manufacturer shall provide an extended warranty. The warranty period covered by the extended warranty shall commence on the date of original shipment of such product – standard warranty for years 1 through 5 and extended standard warranty on years 6 through 10 or 50,000 hours, whichever comes first.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. The L.E.D. luminaires supplied shall have the proper trim, frames, mounting devices, configuration, and accessories necessary to be properly installed in the building construction. Catalog numbers of luminaires in the “Luminaire Schedule” or "Lighting Fixture Schedule" on the Drawings are to establish a type of luminaire and not to determine a method of mounting.

1. Catalog numbers scheduled on the Drawings may indicate luminaire compatibility with certain types of ceiling construction. The Contractor shall determine exact type of ceilings actually to be furnished in each area and shall obtain luminaires to suit, deviating from specified catalog numbers or descriptions only where necessary, and only to the extent necessary to insure luminaire-ceiling compatibility. The Contractor shall notify the Architect/Engineer and Owner in writing where such changes are to be made.

B. Where L.E.D. luminaires are specified on the Drawings to be complete with a flat diffusing lens, the lens shall be virgin acrylic Type 19 pattern with a minimum thickness of 0.156 inches unless otherwise shown on the Drawings.

C. When L.E.D. luminaires are specified on the Drawings to be complete with a curved or rounded lens refractor/diffuser, the lens shall be impact resistant 100% virgin acrylic type with diffusing optical film.

D. Double lock nuts shall be used at the load bearing ends of threaded pipe used as part of a stem mounting assembly.
2.2 POWER SUPPLY UNIT (DRIVERS)

A. Luminaires shall be equipped with an L.E.D. driver(s) that accepts the voltage as indicated on the "Luminaire (Lighting Fixture) Schedule". Individual driver(s) shall be replaceable.

B. Driver(s) shall be UL8750 class 2 compliant for their intended purpose.

C. Total harmonic distortion (THD) for current: ≤ 20%

D. Driver(s) shall be rated to operate between -30°C to 50°C minimum.

E. Individual driver(s) shall be equipped with surge protection (6kV minimum) in accordance with IEEE/ANSI C62.4.1. Driver shall be protected against damage due to either an open circuit or short circuit fault condition on the driver output.

F. Driver(s) shall have a minimum efficiency of 85%.

G. Drivers shall deliver full-range dimming from 0-10V control signal.

2.3 L.E.D. LIGHT SOURCE (LIGHT ENGINE)

A. Individual light engine(s) shall be replaceable.

B. L.E.D. light engine(s) shall have a minimum lifetime of 50,000+ hours at 40º C and shall have a minimum efficiency of 80 lumens per watt.

C. L.E.D. dies shall be tested in accordance with I.E.S.N.A. LM-80-08 standards.

D. Thermal management shall be passive by design and shall consist of heat sinks with no fans, pumps, or liquids.

2.4 SPARE PARTS

A. The Contractor shall furnish to the Owner at the completion of the project, a minimum of 5% spare L.E.D. driver assemblies. LED drivers shall be turned over to the Owner representative in their manufacturer’s protective packaging. LED drivers not in their protective packaging will not be acceptable.

B. The Contractor shall furnish to the Owner at the completion of the project, a minimum of 5% spare L.E.D. light engine assemblies. LED light engines shall be turned over to the Owner representative in their manufacturer’s protective packaging. L.E.D. light engines not in their protective packaging will not be acceptable.

2.5 EXIT LIGHTS

A. Exit lights (signs) shall be universal mount and complete with factory installed light-emitting diodes (L.E.D.’s) mounted behind a red diffusing panel and with direction arrows as shown on the Drawings.
B. Exit lights shall have wire guards where shown on the Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. L.E.D. luminaires (lighting fixtures) shall be installed as shown on the Drawings and in accordance with the manufacturer’s recommendations.

B. Recessed lay-in type linear L.E.D. luminaires shall be supported from the building structure independently of the ceiling grids with a minimum of four (4) steel tie wires per luminaire or as detailed on the Drawings.

C. Recessed lay-in type linear L.E.D. luminaires installed in lay-in type ceiling tile shall be securely fastened from the building structure and be installed in the lay-in type ceiling in such a manner that the louver/lens housing may be easily opened and so that the luminaires may be removed and relocated without forcing the luminaires or changing the grid system tie wires. This Contractor shall coordinate with the ceiling installer before the ceiling grid is installed to assure a mutually satisfactory installation of ceiling and luminaires.

D. Recessed L.E.D. luminaires installed in “hard” ceiling systems (i.e. drywall, metal pan, etc.) shall be securely fastened from the building structure and be installed in such a manner that the louver/lens housing may be easily opened and so that the luminaires may be removed and relocated without forcing the luminaires or changing the ceiling support system. This Contractor shall coordinate with the ceiling installer before the ceiling is installed to assure a mutually satisfactory installation of ceiling and luminaires.

E. Surface mounted linear L.E.D. luminaires shall be supported from the building structure with a minimum of two (2) 1/4 inch threaded rods per each one (1) foot wide by four (4) foot long and a minimum of four (4) 1/4 inch threaded rods per each two (2) foot wide by four (4) foot long luminaire as detailed on the Drawings.

F. Pendant/suspended luminaires shall be supported from the building structure with 1/4 inch threaded rods at each of the luminaires suspension points. Hardware connections to the threaded rods shall be listed components from the luminaire manufacturer and be specifically designed for the type of suspension called for on the Drawings. Installation shall be in accordance with the manufacturer’s instructions.

G. Recessed non-linear L.E.D. luminaires (i.e. downlights) located in lay-in type ceiling tile shall be mounted in the center of the tile or as shown on the Drawings and shall be supported by means of bar hangers extended across the main ceiling support members and also supported from the building structure with no less than one (1) 1/4 inch threaded rod per luminaire. Where luminaires are installed in slopped ceilings the luminaires shall be complete with appropriate slopped ceiling adapters.

H. Surface mounted non-linear L.E.D. luminaires and exit lights shall be supported from the building structure with a minimum of two (2) 1/4 inch threaded rods per luminaire or exit light.
I. 1-1/2 inch x 1-1/2 inch steel framing channel shall be used where required to span bar joists and otherwise facilitate structural support for luminaires and exit lights.

J. Ceiling grid layouts when indicated on the electrical Drawings are for convenience only. This Contractor shall coordinate the luminaires layout with the Architect/Engineer and all other trades before the ceiling grid, air outlets, and luminaires are installed.

K. L.E.D. luminaires installed in mechanical room and other similar equipment rooms shall be located in the field to clear all obstructions such as ducts, piping, bracing, and supports. Where the location of luminaires shown on the Drawings must be radically changed, approval from the Architect/Engineer shall be obtained before the luminaire is placed.

L. Pendant mounted luminaires and exit lights shall be located to avoid mechanical systems, ductwork, piping, structural members, and the like.

M. Supports shall not terminate or be fastened directly to the roof decking.

3.2 GENERAL CONFORMANCE

A. Surface mounted luminaires shall not have gaps between the luminaire and attaching surface, except where required by code regulations or manufacturer’s instructions.

B. Recessed luminaires shall not have gaps between the luminaire trim and the adjacent surface. Where light leaks occur, suitable gaskets shall be furnished and installed.

C. Install luminaires level, plumb and true. Align rows accurately in three (3) dimensions.

D. Where luminaires are to be installed in areas without ceilings, this Contractor shall furnish supports consisting of threaded rods and steel channels as required to have a finished mounting height of 8’-0” to bottom of the luminaire (or other mounting height as shown on the Drawings), unless pendant or chain mounting is indicated on the Drawings or Luminaire Schedule.

E. Recessed luminaires shall be connected with flexible metal conduit or MC Cable (maximum 6’-0” length) from outlet boxes mounted above or alongside of luminaire. Luminaires shall be wired in such a way that removal of one shall not disrupt the continuity of power to the others.

F. All luminaires designated for wet locations shall have sealed conduit entries. Any luminaire leaking water before or during the warranty period shall be repaired or replaced by this Contractor at no additional expense to the Owner.

G. Prior to final inspection, this Contractor shall check all L.E.D. luminaires for damages during construction and replace the damaged luminaires where necessary at no additional expense to the Owner. All luminaires shall be cleaned at the time of final acceptance of the building.

END OF SECTION
PART 1 - GENERAL

1.1 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.2 SCOPE

A. The work covered in this section shall include furnishing and installing complete lighting control systems for the control of selected interior and exterior lighting and other equipment as indicated on the Drawings, detailed in the manufacturer submittal and as further defined herein. Contractor is solely responsible to verify quantity, installation locations and wiring requirements for this project. Specific manufacturers’ catalog numbers, when listed in this section are for reference only. It is the responsibility of this Contractor to verify with the lighting control manufacturer all catalog information and specific product acceptability.

B. The systems shall include but not be limited by the following: Pre-wired, microprocessor controlled relay panels with electrically held, electronically latched relay panels controlled via communication based equipment including digital switches, digital photocells, Digital Time Clock (DTC), other various digital devices, interface cards, occupancy sensors and other devices as shown on the Drawings. The type of lighting control equipment and wiring specified in this section is covered by the description: Microprocessor Controlled Digital Relay Lighting Control system with RS485 Bus communications.

C. Requirements are indicated elsewhere in these specifications for work including, but not limited to, raceways and electrical boxes and fittings required for installation of control equipment and wiring.

D. It is the intent of this specification that the entire lighting control system, as specified herein, be available to all bidders and not “Packaged or Bundled” with any other lighting systems or equipment. Therefore the lighting control system shall be provided as a separate price, to all bidders, at bid time.

1.3 QUALITY ASSURANCE

A. The lighting control systems shall meet the requirements of the National Electrical Code (NEC), state and local codes, and these Specifications.
B. Lighting Control Panels (LCP) shall be UL 916 Listed. LCPs controlling emergency operation by a relay panel shall fully comply with NEC 700.9(B). This Contractor is responsible for verifying compliance.

C. Control wiring shall be in accordance with the NEC requirements for Class 2 remote control systems, Article 725 and manufacturer’s specification and requirements.

1.4 SUBMITTALS

A. This Contractor shall furnish submittals for all components of the lighting control systems in accordance with SECTION 26 05 00 of these Specifications. Submittals shall include the following for review. Submittals not containing all of the information listed below will be rejected.

1. Shop Drawings: Submit dimensioned drawings of complete lighting control systems and accessories including, but not necessarily limited to, relay panels, switches, DTC, photocells and other interfaces. Shop drawings shall indicate exact location of each device. Plans shall be diagrammatical. “Cut Sheet” submittals not acceptable. This contractor shall furnish to the lighting control system manufacturer a copy of the project construction phasing plan for design of the bus system.

2. Product Data: Submit for approval manufacturer’s data on the specific lighting control systems and components. Submittal shall be in both electronic and hard copy formats. To prevent departures from approved system operation, electronic file submitted shall be able to be directly downloaded to the specified system at the manufacturer’s facility. Submit a complete bill of materials with part numbers, description and voltage specifications.

3. One Line Diagram: Submit a one-line diagram of the system configuration indicating the type, size and number of conductors between each component, and each communication bus provided for the project. Submittals that show typical riser diagrams are not acceptable.

4. Programming Forms: Submit programming forms with complete information describing the operation of the lighting control system and all other information necessary to show proper operation of the system.

1.5 SPARE PARTS

A. Provide 10% spare relays per Lighting Control Panel, up to the maximum capacity of the LCP. If the LCP is fully populated with active relays provide a minimum of two spare relays, per relay panel.

B. Provide a ten (10) spare classroom lighting control switches plus one (1) spare digital switch for each additional type of digital switch shown.
C. Provide CD version of manufacturer's operating software to include graphical interface software. Software shall be the latest version.

D. Provide 2 extra sets of as-built and operating manuals.

E. Provide 10 spare keys for each key operated switch.

1.6 SYSTEM DESCRIPTION

A. The lighting control system shall be a networked system that communicates via RS485. The systems must be able to communicate with fully digital centralized relay panels, micro relay panels, digital switches, photocells, various interfaces and shall include all operational software. Relay panels shall control selected interior and exterior lighting and site lighting. Lighting control system shall include all hardware and software. Software shall be resident within the Digital Time Clock (DTC). System shall provide local access to all programming functions via Ethernet connection.

B. System software shall provide real time status of each relay, each zone and each group.

C. Lighting control systems shall be able to be monitored by and take commands from a remote PC. At any time, should the remote PC go off-line all system programming uploaded to the lighting control system shall continue to operate as intended. Systems requiring an on line PC or server for normal operation are not acceptable.

D. All devices shall be pre-addressed at the factory. Field addressing is not acceptable.

E. All programs, schedules, time of day, etc., shall be held in non-volatile memory for a minimum of 10 years at power failure. At restoration of power, lighting control system shall implement programs required by current time and date.

F. System shall be capable of flashing lights Off/On any relay or any zone prior to the lights being turned Off. The warning interval time between the flash and the final lights off signal shall be definable for each zone. Occupant shall be able to override any scheduled Off sweep using local wall switches within the occupied space. Occupant override time shall be locally and remotely programmable and not exceed 2-hours.

G. System shall be capable of implementing On commands, Off commands, Raise (dimming) commands, Lower (dimming) commands for any relay, group or zone by means of digital wall switches, specification grade line voltage type wall switches, photocell, web based software or other devices connected to programmable inputs in a lighting control panel.

H. The lighting control system shall provide the ability to control each relay and each relay group per this specifications requirement. All programming and scheduling shall be able to be done locally at the Master LCP and remotely Text Deleted via the internet. Remote connection to the lighting control system shall provide real time control and real time feedback.
I. System may consist of centralized relay panels, micro relay panels, digital switches, photocells, various digital devices and various digital interfaces. Centralized relay panels and digital switches shall communicate as one network via RS485.

J. Micro relay panels shall be capable of taking inputs from standard, line voltage type switches and outputting up to eight (8) independent 0v to 10v dimming signals. All micro relay panels and devices connected to the relay panels (switches, photocells, occupancy sensors, etc.) shall be wired per lighting control manufacturer’s instructions.

K. 4 thru 16 relay panels shall be available that contain field configurable relays. Panels shall include (4) inputs for photosensors, (4) inputs for occupancy sensors and (4) dry contact inputs. One 0-10V dimming output shall be available per relay.

1.7 SYSTEM TEST AND ACCEPTANCE

A. Prior to the Architect/Engineer’s final site visitation, and acceptance of each construction phase, this Contractor shall conduct a complete operating test of each system including each device. The systems shall test free from grounds, shorts, and other faults. All connections shall be thoroughly checked for mechanical and electrical connection. All equipment shall be demonstrated to operate in accordance with the requirements set forth in these Specifications and as shown on the Drawings.

B. This Contractor shall perform all tests in the presence of the Owner. This Contractor shall furnish all personnel for use in the tests.

C. When the work on the system has been completed and is ready for final review, a visit shall be made by the Owner at which time the Contractor shall demonstrate that the requirements of the Contract as it applies to this system have been carried out and that the system has been adjusted and operated in accordance herewith.

1.8 DOCUMENTATION

A. This Contractor shall furnish to the Owner point-to-point “As Built” wiring diagrams for the lighting control systems. Diagrams must indicate exact mounting location of each system and their devices. This accurate “as built” shall indicate the loads controlled by each relay and the identification number for that relay, placement of switches and location of photocell. Original shall be given to Owner, copies placed inside the door of each LCP.

B. This Contractor shall furnish to the Owner, four (4) sets of factory operation and maintenance manuals. These manuals shall include factory service manuals with complete parts lists, wiring and component schematics including circuit diagrams, programming forms with complete information and all other information necessary for the proper operation, service, and maintenance of the Lighting Control Systems.
1.9 TRAINING

A. This Contractor shall furnish four (4) hours of technical service training to the Owner’s technical staff using the factory operation manuals previously specified.

B. This Contractor shall furnish four (4) hours of operating and programming training to the Owner’s operating staff to be scheduled at the Owner’s convenience during the warranty period.

C. All training specified herein shall be performed by a factory certified technician.

1.10 WARRANTY

A. This Contractor shall deliver the work in first-class operating condition in every respect. This Contractor shall also warrant that the material, equipment, and workmanship furnished shall be entirely free from defects. Any materials, equipment, or workmanship in which defects may develop before or during the warranty period shall be repaired or replaced at the Contractor’s own expense. Refer to SECTION 01 74 00 for the start of the warranty period. This contractor shall further warrant that all material, equipment, and workmanship used in the installation, but not specifically mentioned in the Drawings and Specifications, is the best of their respective kinds and that the construction and installation was performed in accordance with the best accepted standard practices in all details.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Lighting Control Systems products shall be manufactured by Lighting Control & Design (LC&D), Los Angeles, CA, 800.345.4448 or as listed herein by Eaton Cooper Controls. Such firms shall be regularly engaged in the manufacture of lighting control equipment and ancillary equipment, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years. Any product or manufacturer other than those listed in this specification must be pre-approved in accordance with these specifications as hereinbefore described in SECTION 26 05 00.

2.2 MATERIAL AND COMPONENTS

A. Relay panels shall be LC&D GR1400 LTD series (Blue Box LTD), GR2400 series Relay Panel, GR2400i series MicroPanel or GR2400 MicroPanel-8. Relay panels shall have the quantities of single pole and two pole relays and spares, devices and accessories required to perform the lighting control functions described herein and shown on the Drawings.

1. The enclosure(s) shall be NEMA 1 rated with a hinged door cover with a keyed lock, except MicroPanels may have a screwed cover. A 16 gauge steel barrier shall separate the high voltage and low voltage compartments of the panel and separate 120 volts and 277 volts.
2. LCP input power shall be capable of accepting 120 volt or 277 volt without rewiring.

3. Control electronics in the low voltage section shall be capable of driving two (2) to forty-eight (48), 30 ampere, 18,000 SCCR rated latching relays, control any individual or group of relays, provide individual relay overrides, provide a master override for each panel, store all programming in non-volatile memory, after power is restored return system to current state, provide programmable blink warn timers for each relay and every zone, and be able to control relays that default to Open, Normally Open Latching (NOL) or relays that default to Closed, Normally Closed Latching (NCL).

4. Lighting control systems shall be digital and may consist of a Master LCP, Slave LCPs, Micro LCPs, digital switches, photocells and digital interface cards of the quantities necessary to perform the functions shown on the Drawings. All system components shall connect and be controlled via a single Category 5e, 4 twisted pair cable with RJ45 connectors, providing real time two-way communication with each system component. All Micro LCPs shall provide multiple quick connect inputs for photocells and occupancy sensors. Analog systems are not acceptable.

B. Micro Relay Panels

1. Micro relay panels shall have 8, 30a, 18,000 SCCR rated lighting relays and shall control all lighting in the designated area indicated on the plans and be part of the lighting control network. Each micro relay panel shall provide minimum 300ma at 24vdc for powering occupancy sensors. Micro relay panels that require a separate occupancy sensor power pack are not acceptable.

2. Micro relay panel shall provide a minimum 4-programmable photocell inputs, a minimum 4-programmable occupancy sensor inputs and matrixed contact closure inputs. This requirement is to insure integration of entire lighting system into one networked, lighting control system.

3. Micro relay panels shall be capable of outputting minimum 4 and up to 8 independent 0v to 10v dimming signals, one independent dimming signal at each of 8 relays. In order to maximize daylight harvesting and minimize disruption to occupants, each dimming output shall provide adjustment for baseline, start point, mid-point, end point, trim, fade up rate, fade down rate, time delay and enable/disable masking. Any 2 individual relays shall be able to be “bound” to dim as one continuous load. (Relay 1 dims from 100% to 0%, then relay 2 starts dimming from 100% to 0%) All photocell setting must be remotely accessible. Systems providing On, Off with Time Delay only, and system that do not provide remote access are not acceptable.

C. BlueBox LTD Panels
1. BlueBox LTD panels shall contain 4, 8 or 16 field configurable relays as indicated on the plans and be part of the lighting control network. Each BlueBox LTD panel shall provide 300mA at 24VDC for powering occupancy sensors.

2. BlueBox LTC panels shall provide 4-programmable photocell inputs, 4-programmable occupancy sensors inputs and 4-programmable contact closure inputs. All inputs shall be able to be matrixed to any relay in the panel.

3. BlueBox LTD panels shall be capable of outputting a quantity of 0-10V dimming signals equivalent to the number of relays in the panel. In order to maximize daylight harvesting and minimize disruption to occupants, each dimming output shall provide adjustment for baseline, start point, mid-point, end point, trim, fade up rate, fade down rate, time delay and enable/disable masking. Any 2 individual relays shall be able to be “bound” to dim as one continuous load. (Relay 1 dims from 100% to 0%, then relay 2 starts dimming from 100% to 0%) All photocell setting must be remotely accessible. Systems providing On, Off with Time Delay only, and system that do not provide remote access are not acceptable.

D. Standard Output Relays

1. UL listed 30 Amp, Latching, 18,000 SCCR, 277VAC Ballast and HID and 20 Amp Tungsten at 120 VAC.

2. Relays shall be individually replaceable. Relay terminal blocks shall be capable of accepting two (2) #8 AWG wires on both the line and the load side. Systems that do not allow for individual relay replacement or additions are not acceptable.

3. Relays shall be rated for 250,000 operations minimum at a full 30 ampere lighting load, default to closed at normal power loss, Normally Closed Latching (NCL).

4. Other relay types may include: Normally Open Latching (NOL) relay rated for 250,000 operations; a 600 volt 2-pole NO and NC; and a Single Pole, Double Throw (SPDT) relay, as appropriate for the application of this project.

5. Each relay shall have an identification label indicating the originating branch circuit number and panelboard name as indicated on the Drawings. This identification may be in the form of a schedule or directory affixed on the inside door of the panel. Each line side branch circuit conductor shall have an identification tag indicating the branch circuit number.

6. Relays shall be manufactured to default to closed (simulated NC) upon loss of power, unless otherwise noted.

E. Field Configurable Relays (BlueBox LTD only)
1. UL Listed 40A, Latching, 65,000A SCCR (maximum), controlling 120VAC to 480VAC (in multi-pole configuration).

2. Relays shall be individually replaceable. Relay terminals shall be capable of accepting two (2) #8 AWG wires on both the line and the load side.

3. Relays shall have a manual override switch that allows the opening and closing of the relays when the system is not energized.

4. Relays shall be field-configurable into single-, double- and triple-pole configurations through the use of a handle-tie.

5. Relays shall be rated for 250,000 operations minimum at full load and default to normally-closed at the loss of normal power.

6. Each relay shall have an identification label indicating the originating branch circuit number and panelboard name as indicated on the Drawings. This identification may be in the form of a schedule or directory affixed on the inside door of the panel. Each line side branch circuit conductor shall have an identification tag indicating the branch circuit number.

F. Low Voltage Switches

1. All switches shall be digital and communicate via RS485. Contact closure style switches, except as specified for connection to the micro relay panel matrixed contact closure inputs, shall not be acceptable. The programming for a digital switch will reside in the switch itself, via double EPROM memory. Any digital switch button function shall be able to be changed locally (at DTC or a PC) or remotely, via Internet or Ethernet.

2. Digital low voltage switch shall be a device that sits on the lighting control system bus. Digital switch shall connect to the system bus using the same cable and connection method required for relay panels. System shall provide capability to locally and remotely program each individual switch button, monitor and change function of each button locally and remotely. Each button shall be capable of being programmed for On only, Off only, On/Off (toggle), Raise (Dim up) and Lower (Dim down). Switches requiring low voltage control wires to be moved from one input terminal to another to accomplish these functions are not acceptable.

3. Digital low voltage switch buttons shall have custom factory engraving (and filled) as shown on the Drawings. Engraving shall be up to two (2) lines and up to eight (8) characters per line, minimum. Buttons colors shall be white or ivory unless other colors are shown on the Drawings.

4. Keyed switches shall be programmable and connect to the lighting controls system bus.
5. Where indicated on the Drawings, digital switches shall be high abuse vandal resistant, contain no moving parts, and be touch sensitive and available with up to three buttons in a single gang. Multi gang versions shall also be available. Touch pads shall be Stainless Steel and capable of handling both high abuse and wash down locations. High abuse switches shall connect to the lighting control system digital bus. Each high abuse switch touch button shall be able to control any relay or any group in any panel or panels that is part of the lighting control system. Each touch button shall be able to be programmed for On, Off, Toggle or Maintain operation. All programming shall be done locally or remotely Text Deleted or web interface as described in other paragraphs of this section. High abuse switches shall be able to be enabled or disabled digitally. Each touch pad is to be identified as to function by an engraved and filled label. Switches must be capable of handling electrostatic discharges of at least 30,000 volts (1cmspark) without any interruption or failure in operation.

G. DTC – Digital Electronic Time Clock

1. A Digital Time Clock (DTC) shall control and program the lighting control system and supply all time functions and accept interface inputs.

2. DTC shall be capable of up to 32 schedules. Each schedule shall consist of one set of On and Off times per day for each day of the week and for each of two holiday lists. The schedules shall apply to any individual relay or group of relays.

3. The DTC shall be capable of controlling up to 126 digital devices on a single bus and capable of interfacing digitally with other individual busses using manufacturer supplied interface cards.

4. The DTC shall accept control locally using built in button prompts and use of an 8 line 21-letter display or from a computer. All commands shall be in plain English. Help pages shall display on the DTC screen.

5. The DTC shall be run from non-volatile memory so that all system programming and real time clock functions are maintained for a minimum of 15 years with loss of power.

6. DTC shall provide system wide timed overrides. Any relay, group or zone that is overridden On, before or after hours, shall automatically be swept Off by the DTC a maximum of 2 hours later.

H. Remote Programming Connection

1. System shall be remotely programmable via an Ethernet connection that allows factory technicians to connect to the system. Provide all necessary software for local or remote control via Ethernet connection.
2. For single BUS systems, the system shall be provided with a Link-2-Ethernet connection. Link-2-Ethernet panel shall be provided with an Ethernet port for connection to the school’s IT network.

3. For multiple BUS systems, the system shall be provided with an Uplink (one per BUS) and a MetaServer panel. MetaServer panel shall be provided with an Ethernet port for connection to the school’s IT network.

I. Photocells: Photocells shall be mounted at locations indicated on the plans. Photocells used for exterior lights shall provide multiple trip points from 1 roof mounted or wall unit and shall be aimed north. All trip points shall be able to be changed remotely via internet or text deleted. Photocells requiring manual trip point adjustment are not acceptable. Photocell used for interior lighting control shall have multiple settings such as start-point, mid-point, off-point, fade-up, fade-down, etc. All settings shall be remotely accessible and adjustable. Systems providing local adjustment only are not acceptable. Photocells shall be certified to comply with the current energy code covering this project at time of submittal of plans for permit.

J. Interfaces: For expansion capability, the system shall have available all of the following interfaces. Verify and install only those interfaces indicated on the Drawings and/or necessary for the operation of the lighting control systems.

1. A dry contact input interface card that provides 14 programmable dry contact closure inputs. Use manufacturer’s recommended cable to connect input devices to interface card.

2. Interface card providing digital communication from one system bus to another system bus, allowing up to 12,000 devices to communicate.

3. Direct digital interface to DMX 512 based systems. DMX interface shall provide 14 global commands, each of which can be modified locally or remotely using lighting controls manufacturer supplied software. DMX interface shall be integral to the system bus and shall connect and be controlled via a single Category 5, 4 twisted pair cable, providing real time response from the lighting control system to DMX commands.

4. Direct digital interface to building automation systems using DDC protocols such as BACnet, Metasys (N2) and ModBus that accept on/off commands, time schedules and report status of all relays in all panels in real time. Interface cards shall “self-populate” each individual relay and each group to the BAS. All BAS system programming required shall be the responsibility of the BAS system provider.

K. Graphical Interface: System shall have application specific graphical control software that allows the user to graphically locate and control any zone of lighting, indicating real time status. Following are required features:
1. Graphical interface shall have the capability of controlling 20 individual sites with up to 12 graphic screens per site and 1250 control points per graphic.

2. Software shall allow dwg, dwf, dxf, bmp, jpg and wmf files to be imported.

3. Each graphic screen shall be vector based and able to infinitely pan and zoom without any loss of graphic quality and allow for easy creation/editing of each control region.

4. Graphical software shall allow control of multiple buses over a single IP address via Server/Uplink backbone bus. Connection to PC via RS-232, Text Deleted or Ethernet.

5. Graphical software shall have imbedded color pallet allowing individual color choices for all layers and control points.

6. Graphical software shall be password protected and allow direct access to DTC controller.

7. Software shall provide real time status (On/Off) for each relay and real time dimming output level.

L. Low Voltage Cable:

1. This Contractor shall furnish and install the required low voltage cable with RJ45 connectors between all switches and panels. The cable shall be UL listed, plenum rated, unshielded, four (4) twisted pairs, No. 24 AWG, Category 5e, extended distance, high speed data type with a flame retardant polyvinyl chloride jacket and a temperature range for dry locations of minus ten (10) degrees C to sixty (60) degrees C. A Category 5e cable, which meets this specification, is BERK-TEK Cat. No. 10033814 (Pink) or equal as manufactured by AMP, AT&T, BELDEN, THE CABLE COMPANY, GENISIS, HITACHI, MOHAWK, NORTHERN TELECOM, OPTICAL CABLE CORP., PAIGE, or SUPERIOR.

2. Refer to Specification Section 16506 for low voltage three (3) conductor, No. 18 AWG, plenum rated wiring between Lighting Control Panels and occupancy sensors.

3. Low voltage wiring for connections to photocells and contact closure switches to Micro relay panels shall be three (3) conductors, No. 18 AWG, plenum rated with a temperature range for dry locations of minus ten (-10) degrees C to sixty (60) degrees C. A cable that will meet this specification is WEST PENN Cat. No. 25234B or equal by CONSOLATED WIRE, GENERAL CABLE, PAIGE or TAPPAN.
PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Lighting Control Panels

1. Before installing the lighting control panels relay control cabinets check all of the Drawings for possible conflict of space and adjust the location of the relay control cabinet to prevent such conflict with other items. Relay control cabinet locations in electrical rooms and other spaces shall closely follow the layouts shown on the Drawings, leaving sufficient space on walls for future installations of panelboards and/or other electrical equipment.

2. Relay control cabinet shall be securely mounted to steel framing channels, by at least four (4) points, at locations shown on the Drawings. Construction shall be such that additional conduits can be added for future requirements.

3. The cabinets and enclosures shall be mounted and grounded in accordance with the NEC. This Contractor shall furnish all materials necessary for mounting the cabinets.

4. Relay control cabinets will generally be located adjacent to respective lighting panelboards unless otherwise shown on the Drawings. During the construction process, protect all interior components of each relay panel and each digital switch from dust and debris. Any damage done to electronic components due to non-protection shall be the sole responsibility of this Contractor.

5. Micro relay panels shown on the Drawings mounted in classrooms or similar spaces will generally be located above the ceiling either wall mounted or mounted to the building structure. This contractor shall label the ceiling grid directly below where the panel is installed. Label with the lighting control panel designation and room number designation. Labeling shall be done with a BROTHER® Model No. PT-1400 (P-touch) professional label maker, or approved equal, using a laminated type extra strength adhesive tape, Letters/numerals shall be black with a white background.

B. Switches: Provide outlet boxes, single or multi-gang, as shown on the Drawings for the low voltage digital switches. Provide Type 302 (non-magnetic) coverplates for all switches, refer to specification section 16130. Provide labeling as shown on the Drawings.

C. Wiring

1. All vertical wiring for the lighting control systems shall be installed by this Contractor in conduit and/or surface metal raceway as shown on the drawings.

2. All horizontal wiring for the lighting control systems to be installed in areas without a ceiling or in areas without an accessible ceiling shall be installed by
this Contractor in conduit sized for maximum 40% fill, but not less than ½” trade size.

3. All horizontal wiring for the lighting control systems to be installed in areas with accessible ceilings shall be installed by this Contractor and run exposed above the ceiling. Cables shall be supported by “J” hooks to be dedicated to the wiring specified in this specification section.

4. All horizontal wiring for the lighting control systems shall be run at right angles to the building structure.

5. All horizontal wiring for the lighting control systems shall be installed below the roof/floor structural supports (joists, beams, birders, etc.). Wiring installed between the structural supports mentioned above and the roof or floor deck will not be acceptable.

6. All horizontal wiring penetrations for the lighting control systems through new and/or existing walls shall be sleeved. Minimum sleeve size shall be ¾ inch. All sleeves shall be bushed both sides.

7. All wiring for the lighting control systems in millwork or casework only shall be installed in flexible metal conduit, complete with an additional 200-pound pull string.

8. All wiring for the lighting control systems shall be furnished and installed by this Contractor as hereinbefore specified and as shown on the Drawings. All junction box covers shall be stenciled for distinct identification.

9. All low voltage RJ45 wiring connections shall be made by this Contractor as detailed on the Drawings using the 568A data only configuration. Lighting control system buss cables shall be continuous from the equipment enclosures to all other lighting control devices. The use of splices, “T” taps, or terminators in the buss wiring between devices is not acceptable.

10. All wiring shall be checked and tested by this Contractor to insure the system is free from grounds, opens, and shorts.

11. Do not mix low voltage and high voltage conductors in the same conduit.

12. Ensure low voltage conductors, conduits or control wires do not run within four (4) inches parallel to current carrying conduits or cables.

13. Place manufacturer supplied “terminators” at each end of the system bus per manufacturer’s instructions.

14. Neatly lace and rack wiring in cabinets.
15. Plug in Category 5e cable at the indicated RJ45 port provided at each lighting control device, per manufacturer’s instructions.

16. Do not exceed 4000 ft-wire length for each system bus.

17. All items on the bus shall be connected in sequence (daisy chained). Star and spur topologies are not acceptable.

18. Each construction phase of this project shall have its own separate communication bus.

3.2 INSTALLATION AND SET-UP

A. Verify that conduit for line voltage wires enters the panel in line voltage areas and conduit for low voltage control wires enters the panel on low-voltage areas. Refer to manufacturer’s plans and approved shop drawings for location of line and low-voltage areas. It is the responsibility of this Contractor to verify with the lighting control manufacturer all catalog information and specific product acceptability.

B. For approved line voltage type Micro relay panel switches connected to matrixed inputs of the Micro relay panel, furnish #18 AWG conductors. For all other digital switches provide wiring required by the system manufacturer.

C. Contractor shall test all low voltage cable for integrity and proper operation.

D. Unused openings in the cabinets shall be effectively closed.

E. Lugs shall be suitable and listed for installation with the conductor being connected.

F. Neatly lace and rack wiring in cabinets. Conductor lengths shall be maintained to a minimum within the wiring gutter space. Conductors shall be long enough to reach the terminal location in a manner that avoids strain on the connecting lugs and maintain the required bending radius of conductors inside cabinets.

G. Follow the manufacturer’s torque values to tighten lugs.

H. Before energizing the panel, the following steps shall be taken:

1. Retighten connections to the manufacturer’s torque specifications. Verify that required connections have been furnished.

2. Remove shipping blocks from component devices and the panel interior.

3. Remove debris from panel interior.

I. Follow manufacturer’s instructions for installation and for all low voltage wiring.
J. This contractor shall tag the cable at either end at the connection point. Label with the lighting control panel designation and room number designation. Labeling shall be done with a BROTHER® Model No. PT-1400 (P-touch) professional label maker, or approved equal, using a laminated type extra strength adhesive tape, Letters/numerals shall be black with a white background.

3.3 SERVICE, SUPPORT AND COMMISSIONING

A. Start Up: This Contractor shall contact the system manufacturer at least 7 days before activation of the system. This Contractor shall connect the Link-2-Ethernet (for one BUS systems) or MetaServer (for multiple BUS systems) to the school’s Intranet network switch. This Contractor shall contact FCPS IT 14 days prior to startup for a dedicated IP address that will be assigned to the Link-2-Ethernet or MetaServer. Dedicated IP address shall be provided to factory technician, by this Contractor, upon request.

B. Ethernet factory support shall be available at no additional cost to the Contractor or Owner both during and after the warranty period. Factory to pre-program the lighting control system per plans and approved submittal, to the extent data is available. Text deleted. Upon request, manufacturer to provide remote Ethernet software at no added cost to the system owner. No exceptions.

C. Upon completion of the installation of the entire lighting control system, and prior to the substantial completion of the project, this contractor shall have the system commissioned by an authorized system manufacturer’s representative. This contractor shall be responsible for participation and coordination within the Commissioning process including but not limited to:

1. Verify proper installation and performance of the lighting control system.
2. Provide a factory trained lighting control system technician/programmer for use during system verification and functional performance testing.
3. Manipulate the lighting control systems to facilitate verification and performance testing.
4. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the Owner.
5. Address current A/E punchlist items before functional testing.
6. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, Owner and A/E and retest the equipment.
7. On multi-phased projects, each phase shall have a separate startup by a factory trained lighting control system technician. Contractor to contact factory a minimum of 7 business days prior to technician being required to be onsite.
3.4 CLEANING

A. Remove debris from the Lighting Control Panels, wipe dust and dirt from all components, and repaint marred surfaces with touch-up paint to match the original finish.

B. Clean photocell lens as recommended by manufacturer.

C. Clean all switch faceplates.

3.5 ON-SITE AS-BUILT DRAWINGS

A. The Contractor shall provide one (1) set of the as-built lighting floor plans (including site lighting plans associated with this lighting control system) and one (1) set of the lighting control system supplier’s point-to-point as-built wiring diagrams and supporting drawings as hereinbefore described for permanent use on-site. The Contractor shall: laminate each page of these drawings; provide a rigid means for mounting such as 1/4 inch thick x two (2) inches wide x width of the drawings through-bolted wood along the left edge of the drawings; furnish and install hanging hooks on the back of the Main Electric Room door; and hang the bound set of drawings.

END OF SECTION
PART 1 - GENERAL

1.1 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.2 SCOPE

A. The work covered under this Section shall include furnishing and installing a complete operational occupancy sensor based lighting control system as shown on the Drawings, detailed in the manufacturer’s submittal and as herein specified.

B. Work described in this section shall be coordinated with all applicable plans and specifications, including by not limited to interfacing with microprocessor based Lighting Control Systems, wiring, raceways, boxes and fittings, luminaires, and HAVC systems.

1.3 QUALITY ASSURANCE

A. Occupancy sensors shall conform to the requirements of the National Electrical Code (NEC), state and local codes, and these Specifications.

B. All components shall be listed by Underwriter's Laboratories, Inc. (UL) for their intended use and shall bear the UL label.

C. Products supplied shall be from a single manufacturer that has been continuously involved in manufacturing of occupancy sensors for a minimum of five (5) years. Mixing of manufacturers shall not be allowed.

D. Products shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rating of less than 1/3 of 1%.

E. Wall switch products must be capable of withstanding the effects of inrush current. Submittals shall clearly indicate the method used.

1.4 SUBMITTALS

A. Submittals are required in accordance with SECTION 26 0500 of these specifications. Submittals shall include, but not be limited to the following for review. Submittals not containing all of the information listed below will be rejected.
1. Manufacturers shall substantiate conformance to this specification by providing the necessary documents, performance data and wiring diagrams. Any deviations to the specifications must be clearly stated by letter and submitted.

2. Submit a scaled building lighting plan (minimum size of 1/16” = 1'-0”) clearly marked by the manufacturer showing proper product, location and orientation of each sensor and power pack (switch pack). Plans shall show detection coverage patterns. If necessary for clarity, provide a 1/8” = 1'-0” scaled plan or one plan with coverage areas shown and another plan with the other information shown. Illegible drawings will be rejected.

3. Submit interconnections diagrams per major subsystem and interfacing with Lighting Control Panels (LCP) [Refer to SECTION 26 59 23], showing proper wiring.

4. Submit standard catalog literature which includes performance specifications indicating compliance to the specification.

5. Catalog sheets must clearly state any load restrictions when used with electronic ballasts.

1.5 SYSTEM DESCRIPTION

A. The objective of this specification section is to ensure the proper installation of the occupancy sensor based lighting control system so that lighting is turned off automatically after reasonable time delay when a room or area is vacated by the last person to occupy said room or area.

B. The occupancy sensor based lighting control shall accommodate all conditions of space utilization and irregular work hours and habits.

1.6 SYSTEM TEST AND ACCEPTANCE

A. Prior to the Architect/Engineer’s final site visitation, and acceptance of each construction phase, this Contractor shall conduct a complete operation test of each system including each device. The systems shall test free from grounds, shorts, and other faults. All connections shall be thoroughly checked for mechanical and electrical connection. All equipment shall be demonstrated to operate in accordance with the requirements set forth in these Specifications and as shown on the Drawings.

B. This Contractor shall perform all tests in the presence of the Owner. This Contractor shall furnish all personnel for use in the tests.

C. When the work on the system has been completed and is ready for final review, a visit shall be made by the Owner at which time the Contractor shall demonstrate that the requirements of the Contract as it applies to this system have been carried out and that the system has been adjusted and operated in accordance herewith.
1.7 TRAINING

A. Upon completion of the project, the Contractor and manufacturer’s factory authorized representative shall provide a minimum of four (4) hours of training to familiarize the Owner with the operation, use, adjustment, and problem solving diagnosis of the occupancy sensing devices and systems.

1.8 WARRANTY

A. This Contractor shall warrant all equipment furnished in accordance with this specification to be undamaged, free of defects in materials and workmanship, and in conformance with these specifications. The warranty shall include repair or replacement, and testing without charge to the Owner on all or any parts of equipment which are found to be damaged, defective or non-conforming. There shall be no deductibles applied to such warranty. Satisfactory warranty documents shall be furnished. Refer to SECTION 01 74 00 WARRANTIES AND BONDS.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The lighting occupancy sensors shall be manufactured by SENSORSWITCH, as listed or equal by GREENGATE (COOPER CONTROLS), HUBBELL, or WATTSTOPPER.

B. The listing of any manufacturer as “equal” does not imply automatic approval. This Contractor shall ensure submittals made are for sensors and associated equipment which meets or exceeds the specifications included herein.

2.2 LIGHTING OCCUPANCY SENSORS

A. Occupancy sensors shall consist of, but not be limited to the following:

1. Sensing technology shall be passive infrared (PIR), MicroPhonics (or ultrasonic), dual technology having both PIR and MicroPhonics (or ultrasonic).

2. Passive infrared sensors shall provide high immunity to false triggering from RFI (hand-held radios) and EMI (electrical noise in the line). The PIR sensors shall have a multiple segmented Fresnel lens, in multi-tier configuration, with grooves-in to eliminate dust and residue build-up.

3. MicroPhonics shall be used in conjunction with PIR (passive infrared) sensing technology to enable a sensor to provide dual-technology sensing that is completely passive. MicroPhonics shall detect an occupant by detecting leading edge noises typical of human activity while filtering out building noises. The MicroPhonic sensing circuitry shall have automatic gain control to dynamically adapt to the sensor to its environment allowing it to filter out background noise.

4. Ultrasonic sensors shall be able to adjust the detection threshold dynamically to compensate for constantly changing levels of activity and air flow throughout controlled spaces. Ultrasonic operating frequency shall be crystal controlled at
32 kHz within $\pm 0.002\%$ tolerance, or 40 kHz within $\pm 0.002\%$ tolerance to assure reliable performance and eliminate sensor cross-talk. Sensors using multiple frequencies are not acceptable.

5. Dual technology sensors shall consist of PIR and MicroPhonics (or ultrasonic) technologies for occupancy detection.

6. All sensors shall be capable of operating normally with electronic ballasts, PL lamp systems and rated motor loads.

7. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic reduction shall occur in coverage due to the cycling of air conditioner or heating fans.

8. All sensors shall have readily accessible, user adjustable settings for time delay and sensitivity. Settings shall be located on the sensor (not the control unit) and shall be recessed to limit tampering.

9. In the event of failure, a bypass manual override shall be provided on each sensor. When bypass is utilized, lighting shall remain on constantly or control shall divert to a wall switch or lighting control panel until the sensor is replaced. This control shall be recessed to prevent tampering.

10. All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.

B. Ceiling mounted room occupancy sensors shall be low voltage dual technology type consisting of passive infrared (PIR) and MicroPhonic (or ultrasonic) technologies with $360^\circ$ coverage for large classrooms, open office spaces or areas up to 1600 square feet; SENSORSWITCH Model CM PDT 10. Sensors shall operate on 12 to 24 VAC or VDC and NEC Class 2 wiring. Each sensor shall be complete with one (1) power pack or two (2) power packs for rooms requiring two (2) lighting branch circuits. Rooms requiring multiple sensors may only require one (1) power pack for multiple sensors, where shown on the Drawings. Sensors shall also be equipped with an additional isolated relay.

1. Occupancy sensors shown on the Drawings to be powered from a Lighting Control Panel generally will not require a power pack.

C. Ceiling mounted (or wall mounted where shown on the Drawings) room occupancy sensors shall be low voltage dual technology type consisting of passive infrared (PIR) and MicroPhonics (or ultrasonic) technologies for directional one-way coverage for classrooms, offices or areas up to 1000 square feet; SENSORSWITCH Model WV PDT 16. Sensors shall operate on 12 to 24 VAC or VDC and NEC Class 2 wiring. Each sensor shall be complete with one (1) power pack or two (2) power packs for rooms requiring two (2) lighting branch circuits. Rooms requiring multiple sensors may only require one (1) power pack for multiple sensors, where shown on the Drawings. Sensors shall also be equipped with an additional isolated relay.

1. Occupancy sensors shown on the Drawings to be powered from a Lighting Control Panel generally will not require a power pack.
D. Corridor and corridor lobby ceiling mounted occupancy sensors shall be low voltage dual-technology passive infrared (PIR) and MicroPhonic (or ultrasonic) technology type with coverage of approximately 50 linear feet; SENSORSWITCH Model CM PDT 10. Sensors shall operate on 12 to 24 VAC or VDC and NEC Class 2 wiring. Sensors shall be powered from a lighting control panel or power pack and/or as shown on the Drawings. Sensors shall also be equipped with an additional isolated relay.

E. Wall switch occupancy sensors shall be line voltage dual-technology passive infrared (PIR) and MicroPhonic (or ultrasonic) technology type with coverage of approximately 30 to 40 square feet for use in small utility/storage rooms, small toilet rooms, etc. as shown on the Drawings; SENSORSWITCH Model WSX PDT-IV. Sensors shall operate on 120 or 277 volts. Load rating shall be 0 to 800 watts ballast or tungsten at 120 volts and 0 to 1200 watts ballast at 277 volts. Sensor shall use zero-cross circuitry to detect when the sine wave crosses at the “zero-point” so as to minimize wear on the switching contact.

1. Contractor shall supply stainless steel cover plates, not the plastic cover plates that may be included in the switch packaging. See Specification Section 16130 for type.

F. Wall switch occupancy sensors, with dual ON/OFF button switches and dual relays for controlling two lighting loads or circuits, shall be line voltage dual-technology passive infrared (PIR) and MicroPhonic (or ultrasonic) technology type with coverage of approximately 30 to 40 square feet for use in small utility/storage rooms, small toilet rooms, etc. as shown on the Drawings; SENSORSWITCH Model WSX PDT 2P-IV. Sensors shall operate on 120 or 277 volts. Load rating shall be 0 to 800 watts ballast or tungsten at 120 volts and 0 to 1200 watts ballast at 277 volts.

1. Contractor shall supply stainless steel cover plates, not the plastic cover plates that may be included in the switch packaging. See Specification Section 16130 for type.

2.3 POWER PACKS AND AUXILIARY RELAY PACKS CONTROL UNITS

A. Power packs shall accept 120 or 277 volts, be plenum rated, and provide Class 2 power to a minimum of two (2) occupancy sensors. Power packs shall be able to externally mount through a 1/2” knock-out on a standard electrical enclosure (junction box) and be an integrated, self-contained unit consisting internally of an isolated load switching control relay (load rated 20 amperes at 120 or 277 volts) and a transformer to provide low voltage power; SENSORSWITCH Model PP 20 Power pack shall provide a minimum of 150mA at 15 VDC to drive occupancy sensors and auxiliary relay packs.

B. Power packs shall use zero-cross circuitry to detect when the sine wave crosses at the “zero-point” so as to minimize wear on the switching contact.

C. Auxiliary relay packs shall be the same self-contained type unit as the power pack herebefore described, except shall not include a transformer; SENSORSWITCH Model SP 20. The auxiliary relay pack shall be used to control another lighting load with a
different line voltage than the power pack. Auxiliary relay packs shall be powered from a power pack with 15 VDC.

2.4 ISOLATED RELAY

A. Sensors hereinbefore described to include an isolated relay shall have the relay be internal with Normally Open, Normally Closed and Common outputs for use with Lighting Control Panels (LCP), HVAC control, and other control options as shown on the Drawings. Sensors utilizing separate components or specially modified units to achieve this function shall not be acceptable.

B. Corridor and other location occupancy sensors indicated on the Drawings to interface with a Lighting Control Panel (LCP) shall have the isolated relay send a contact closure signal to the Lighting Control System. These sensors shall be powered from the LCP and not by a power pack. Operation of sensors in corridors and other areas where sensors are interfaced with the lighting control system shall operate in a manner such the lighting in the controlled areas is “held-on” during normal school operating hours. After normal schools hours, these controlled areas shall respond to the occupancy sensors for lighting control. See the Drawings and details for the sequence of operations via the LCP.

2.5 WIRING

A. Low voltage wiring between occupancy sensors and power packs shall be three (3) conductor, No. 18 AWG, unshielded, plenum rated with a temperature range for dry locations of minus ten (10) degrees C to sixty (60) degrees C. A cable that will meet this specification is WEST PENN Cat. No. 25234B.

B. Low voltage wiring between occupancy sensors and Lighting Control Panels (LCP) shall be three (3) conductor, No. 18 AWG, unshielded, plenum rated with a temperature range for dry locations of minus ten (10) degrees C to sixty (60) degrees C. A cable that will meet this specification is WEST PENN Cat. No. 25234B.

PART 3 - EXECUTION

3.1 INSTALLATION

A. It shall be the Contractor’s responsibility to provide the quantity of occupancy sensors required for complete and proper volumetric coverage to completely cover the controlled areas. Rooms shall have ninety (90) to one hundred (100) percent volumetric coverage to completely cover the controlled areas to accommodate all occupancy habits of single or multiple occupants at any location within the rooms. Proper judgment must be exercised in executing the work so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations, interference of structural components, or furnishings in the rooms or spaces. The locations and quantities of sensors shown on the Drawings are based on coverage patterns of SENSORSWITCH sensors. Sensors of other approved manufacturers may require different quantities of sensors for full coverage of spaces being controlled. The sensors shown on the drawings are diagrammatic and do not necessarily show the exact locations of the sensors. This contractor shall confirm with the occupancy sensors manufacturer
B. Line voltage wall switch type occupancy sensors shall be installed in a suitable wall outlet box in a method recommended by the equipment manufacturer similar to a standard line voltage light switch.

C. Low voltage occupancy sensors shall be securely mounted to a ceiling or wall mounted junction box in a method recommended by the sensor manufacturer. Ceiling mounted junction boxes shall be supported from the building structure with no less than one (1) ¼” threaded rod. Sensors shall be wired as detailed on the Drawings and as recommended by the equipment manufacturer.

D. Power packs shall be located in accessible ceiling spaces and securely mounted to a standard electrical enclosure (junction box) through a standard 1/2” chase nipple. Plastic clips into the junction box shall not be acceptable. Junction box shall be supported from the building structure with no less than one (1) ¼” threaded rod. All Class 1 wiring shall pass through the chase nipple into the junction box without any exposure of wire leads. Low voltage Class 2 wiring to the sensors shall not be exposed in finished spaces. Power packs shall be wired as detailed on the Drawings and as recommended by the equipment manufacturer.

E. Supports shall not terminate or be fastened directly to the roof decking except where specifically approved by the Owner.

F. Wiring:

1. All low voltage field wiring in finished and unfinished spaces shall be installed by this Contractor in 1/2-inch conduit and/or surface metal raceway as shown on the Drawings or hereinbefore specified elsewhere. Conduit fill shall not exceed the conduit space capacity.

2. All low voltage field wiring to be installed in areas without a ceiling or in areas without an accessible ceiling shall be installed by this Contractor in 1/2-inch conduit.

3. All low voltage field wiring to be installed in areas with accessible ceilings shall be installed by this Contractor bundled together and run exposed above the ceilings. Bundles shall be supported by "J" hooks mounted not more than four (4) feet on center. “J” hooks shall be dedicated to the wiring specified in this specification section.

4. All low voltage field wiring shall be run at right angles to the building structure.

5. All low voltage field wiring shall be installed below the roof/floor structural supports (joists, beams, girders, etc.). Wiring installed between the structural supports mentioned above and the roof or floor deck will not be acceptable.
6. All low voltage field wiring penetrations through new and/or existing walls shall be sleeved. Minimum sleeve size shall be one (1) inch. All sleeves shall be bushed both sides.

7. All low voltage field wiring for the occupancy sensor systems shall be furnished and installed by this Contractor. All junction box covers shall be stenciled for distinct identification.

8. All wiring connections shall be made by this Contractor as shown on the Drawings and as recommended by the equipment manufacturer. Splices shall be made only in junction boxes.

9. All occupancy sensor system wiring shall be checked and tested by this Contractor to insure the system is free from grounds, opens, and shorts.

10. Contractor shall test all low voltage cable for integrity and proper operation of the system.

G. The Contractor shall arrange a pre-installation meeting with the occupancy sensors manufacturer’s factory authorized representative, at the project facility to verify proper placement of sensors and installation criteria.

3.2 TESTING

A. Sensor Testing and Adjustment:

1. At the time of installation, the Contractor shall be responsible for testing and adjusting each sensor for proper detection of motion appropriate to room usage. The Contractor shall follow the testing and adjustment procedures as written in the installation instructions for each sensor model. **Note: Due to room conditions it may be necessary for the Contractor to make adjustments, change the location or type of sensor to obtain proper operation and coverage of the system in each room and should therefore make labor and material allowances for such changes and adjustments.**

END OF SECTION