PROJECT MANUAL

FOR THE

CMHA EASTON OFFICE RENOVATION

3400 Morse Crossing
Columbus, OH 43219

March 28, 2025

PREPARED FOR

CMHA
Columbus Metropolitan Housing Authority
1 RIVERSIDE PLAZA
COLUMBUS, OHIO 43215

COLUMBUS METROPOLITAN HOUSING AUTHORITY
COMMUNITY. COMMITMENT. COLLABORATION.

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TABLE OF CONTENTS

DIVISION 26 – ELECTRICAL

DIVISION 27/28 – COMMUNICATION

DOCUMENT 00 01 07

SEALS PAGE

1.1 DESIGN PROFESSIONALS OF RECORD

A. Architect:
   1. Jonathan D. Moody
   2. Lic. 1215709
   3. Responsible for Divisions 01-49 Sections except where indicated as prepared by other design professionals of record.

B. Fire-Protection Engineer:
   1. Tim Prater
   2. Lic. E-51932
   3. Responsible for Division 21 Sections.

C. Plumbing Engineer:
   1. Tim Prater
   2. Lic. E-51932
   3. Responsible for Division 22 Sections.

D. HVAC Engineer:
   1. Tim Prater
   2. Lic. E-51932
   3. Responsible for Division 23 and 25 Sections.

E. Electrical Engineer:
   1. Gregory S. Owens
   2. Lic. E-63408
   3. Responsible for Division 26, 27, and 28 Sections.

END OF SECTION

SECTION 01 23 00

ALTERNATES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.02 GENERAL REQUIREMENTS

A. Definitions and Explanations: "Alternates" are defined as alternate products, materials, equipment, systems, methods, units of work or major elements of the construction, which may, at Owner's option and under terms established by Instructions to Bidders and in the Contract or Agreement, be selected for the work in lieu of corresponding requirements of Contract Documents. Selection may occur prior to Contract date, or may, by the Agreement, be deferred for possible selection at a subsequent date. Alternates may or may not change scope and general character of the work substantially. Requirements of this section may be related to, but must not be confused with, requirements of Contract Documents related to "allowances", "unit prices", change orders", "substitutions" and similar provisions.

1. Refer to the Contract, and subsequent modifications thereof, for determination of which several scheduled "Alternates" herein have been accepted, and, therefore, are in full force and effect as though included originally in the contract documents for the base bid.
2. The Owner reserves the right to accept or reject any Alternate at the time of awarding the Contract. If, during the progress of the Work, it should become desirable to reinstate any Alternate not included in the Contract, the Owner reserves the right to reinstate the Alternate at the price bid by the Contractor provided that such actions taken in sufficient time as not to delay the progress of the work.

B. Notification: Immediately following the award of the Contract, prepare and distribute to each entity to be involved in performance of the work, a notification of the status of each alternate scheduled herein and including those subsequently added by notification during bidding. Indicate which alternates have been: 1) accepted, 2) rejected, and, 3) deferred for consideration at a later date as indicated. Include full description of negotiated modifications to alternates, if any.

C. General: The descriptions herein for each alternate are recognized to be incomplete and abbreviated, but imply that each change must be complete for the scope of work affected. Refer to all other applicable specification sections and to applicable drawings, for specific requirements of the work, regardless of whether references are so noted in the description of each alternate.

It is recognized that descriptions of alternates are primarily scope definitions, and do not necessarily detail the full range of materials and processes needed to complete the work as required.

1.02 SCHEDULE OF ALTERNATES

A. Contract Alternates

1. Alternate No. 1: CAR CHARGERS

a. Add Two (2) dual electrical car chargers as indicated on the drawings.

b. Provide circuits for an additional two (2) dual chargers.

2. Alternate No. 2: EXTERIOR PATIO

a. Extend the existing patio to the west as indicated on the drawings.

b. Work includes concrete slab, decorative aluminum railing & gate, concrete footing, CMU pier foundation, brick & CMU pier with limestone cap, and bushes to match existing.

3. Alternate No. 3: FIRST FLOOR FLOORING

a. Provide new flooring in the following rooms not included in the base bid: 128, 132, 133, 134, 140, and 142.

4. Alternate No. 4: NOT USED

5. Alternate No. 5: GLASS STAIR RAILING

a. Provide a new railing at the open stairs in the main lobby as indicated on the drawings. This requires removing half-height walls along the stairs and on the second floor around the opening in the floor.

b. Replace the flooring on the entire stairs with tile.

6. Alternate No. 6: KITCHEN CASEWORK

a. Replace the casework, sink, and countertops in Kitchen 122 as indicated on the drawings.

7. Alternate No. 7: KITCHENETTE CASEWORK

a. Replace the casework, sinks, backsplashes, side splashes, and countertops in the two Kitchenettes in Room 133 as indicated on the drawings.

END OF SECTION

SECTION 01 73 00

EXECUTION REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Requirements of this Section apply to the Work of all other Sections.

B. Section Includes:

1. Examination of Substrate.
2. Preparation.
3. Installation.
4. Workmanship.
5. Protection.
6. Overhead Attachments.
7. Prohibited Methods.

1.02 RELATED SECTIONS

A. Quality Control: Section 01 45 00.

B. Cutting and Patching: Section 01 73 29.

C. Shop Drawings, Product Data and Samples: Section 01 33 23.

D. Product Requirements: Section 01 60 00.

1.03 STANDARDS

A. Standards, codes and regulations published by Manufacturer's Associations, governmental agencies and other regulatory authorities form a part of these Specifications as minimum requirements. Such references include the latest issue and all amendments up to 30 days prior to the Bid Date.

B. "Governing Authority" means all federal, state and local laws and regulations.

C. Where differences occur between the Contract Documents and such standards, the most restrictive requirement shall apply.

D. Supply all materials and perform all work in accordance with the Manufacturer's Specifications and installation procedures, and in conformance with published trade and manufacturer's association standards, unless specifically noted otherwise herein.

1.05 NON-CONFORMING WORK

A. Faulty work or work not in conformance with the Contract Documents will not be permitted by the Architect.

1. It is the responsibility of the Contractor to propose a remedy by means of detailed drawings and written documentation and submit such documentation to the Architect for comments.
2. All costs for the removal and reconstruction of such work, as well as additional services of the Architect, shall be paid for by the Contractor.

PART 2 PRODUCTS - NOT APPLICABLE

PART 3 EXECUTION

3.01 EXAMINATION OF SUBSTRATE

A. Examine the substrates or structure to which a product is to be applied or installed. Do not proceed until unsatisfactory conditions have been corrected. Starting the work indicates acceptance of conditions and the installer assumes full responsibility for results.

B. Check the substrate or structure for proper tolerances and clearances. Tolerances are listed under individual specification Sections.

3.02 PREPARATION

A. Substrate: Where the products are applied to a substrate, prepare the substrate as recommended by the product manufacturer. That generally includes the following:

1. Bringing substrate to a uniform surface by smoothing uneven surfaces and filling holes, cracks and depressions with recommended filler or compatible type material.
2. Depressed Slabs: Bring to required elevation to receive finished materials where finished materials cannot completely fill depression. Use approved cementitious filler or compatible type material. Coordinate depressed slab locations with finish material locations.
3. Remove substances such as dust, oils and other foreign matter, not compatible with the product.
4. Surfaces shall be dry, unless moisture content or wetting requirement is specified or recommended.

B. Concrete Slabs: Provide steel shot abrasive cleaning of concrete slabs receiving designated finish flooring materials.

1. Designated Finish Flooring Materials

a. Cementitious or cementitious set materials.
b. Sheet flooring materials.
c. Waterproofing materials.
d. Paint materials.
e. Polymer or epoxy type seamless flooring.

2. Equipment: Electric powered portable unit with self-contained dust collection system. Size(s) of unit(s) and shot media suitable for conditions and proposed finish materials. WHEELABRATOR CORP. "Blastrac" or similar type system by SASE COMPANY INC., BW MANUFACTURING or INNOVATECH.
3. Cleaning: Remove concrete surfaces to sufficient depth to remove bond breakers and contaminants such as curing compounds, oils, and other foreign matter which may be detrimental to the completed flooring installation.
   a. Work smoothly and evenly over entire surface; avoid creating dips, ridges, or other imperfections which would show or telegraph in the completed installation.
   b. Small transitions for different flooring materials may be obtained by multiple passes if carefully executed to create smooth even slope of not more than 1/8" in 2 feet.
4. Clean floor as near as possible to flooring installation to avoid contamination from work of other trades. Protect clean floor from soiling with suitable sheet materials. Reclean soiled areas.

C. Inserts and Anchorages

1. Anchorages where not detailed are the responsibility of the installer to design a suitable connection, structurally sound, and aesthetically acceptable to the Architect. Furnish calculations, drawings and product data when requested by the Architect. Such information may or may not be returned as indicated in Section 01 33 23.
2. It is the responsibility of the installer to furnish built-in fastening devices for his/her product to the proper trade for installation as the work proceeds.
3. In the event such devices are not furnished in time to be built-in, it is the installer's responsibility to provide other methods for attaching their product. Submit drawings and other required data to the Architect.

D. Templates: Provide templates, diagrams and other coordinating documents to the proper Contractor, manufacturer or supplier of related items affecting the Work.

E. Dimensions

1. If the exact location of an item is not indicated by dimension on the Drawings or noted in the Specifications, the Architect reserves the right to determine such location in the field prior to roughing-in.
2. If the exact dimensions of a product are not indicated, the Architect reserves the right to determine dimensions prior to the ordering or fabrication of a product.
3. Such dimensional changes shall not be a basis for changes in the Contract

Sum.

4. Where miscellaneous devices, such as thermostats, switches, controls, grilles, pipes, or outlets of any nature are not specifically located by the Contract Documents, request such location or obtain approval of the location prior to installation. If approval has not been obtained, the Architect may direct the relocation of such devices at the expense of the installer.

3.03 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
   a. Where pipes occur in partitions, furred-out spaces and chases, determine exact location and size and fit entirely concealed into allotted space. Report conflicts to Architect prior to installation.
   b. Where two or more pipes are to installed in parallel, or parallel to the piping of other trades, the piping shall be installed with sufficient space between the pipes to allow for the proper application of pipe covering, painting, and servicing.
   c. Furnish advance information on locations and sizes of frames, boxes, sleeves and openings needed for the Work to installers.
4. Install work to allow for installation of future work identified on drawings.
5. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.

B. Install products in accordance with manufacturer's recommendations or the requirements of trade associations, listed standards, Shop Drawings and Contract Documents.

C. If a conflict exists between these references, the most strict requirements govern. If printed instructions are not available, consult with the manufacturer or the manufacturer's field representative, where applicable.

D. Provide hangers, auxiliary framing, and other means for installing ceiling suspension systems, lighting fixtures, diffusers, and other equipment in ceilings to avoid ductwork, piping, etc.

1. Suspend from structural members (i.e. joists, beams, etc.), and not from ductwork or piping.
2. Provide supplemental framing members (i.e. angles, tubes, light gage steel framing, etc.) to span between structural members where required to support items of this paragraph C.

E. Install work that will not interfere with the proper installation of the Work of other trades.

F. Install work in a manner to facilitate operating, servicing and repairing.

G. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

H. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

3.04 SPACE PREFERENCE

A. Carefully check and coordinate the location and level of all Work to avoid conflicts between all contractors. Where conflicts occur, the following preferences shall generally govern:

1. Recessed electrical light fixtures
2. High and medium pressure ductwork
3. Low pressure ductwork
4. Soil, waste, vent and storm piping
5. Sprinkler piping
6. Liquid heat transfer and refrigerant piping
7. Domestic water piping
8. Electrical conduits from branch circuits

B. However, no ductwork or liquid heat transfer main shall have preference over plumbing piping below plumbing fixtures, nor over electrical conduits above or below electrical switchgear and panels. No piping conveying liquids shall be installed directly over electrical or elevator equipment. No piping shall be installed in electrical or elevator equipment rooms.

C. Where headroom or space conditions resulting from application of these preferences appear inadequate, notify the Architect prior to installing the Work.

D. Coordinate the mounting heights of busways, electrical equipment and raceways to clear the opening heights of doors, the height of vehicles and the heights of equipment which needs to be routinely removed, and out of paths required for maintenance.

3.05 WORKMANSHIP

A. Install products straight, plumb, level and in line. Securely attach items to the substrate, using recommended adhesives, mechanical fasteners or other devices. Where holes are provided for attachment, do not field drill or cut new holes without the approval of the Architect.

B. Where applicable, match finished work to the approved samples or mock-ups.

C. Conceal fasteners wherever possible, unless exposed fasteners are permitted or specified.

D. Weld in accordance with AWS standards; comply with AWS for qualifications of operators and for workmanship.

E. Visual Effects: Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.

F. Recheck measurements and dimensions, before starting each installation.

3.06 PROTECTION

A. Protect finished surfaces of product being installed and surrounding products from damage during installation. Provide protective devices as required and as recommended by the manufacturer. Cover work subject to damage at the end of each day's work.

B. Coat concealed surfaces of metal products with a bituminous or other approved coating to prevent contact between dissimilar metals or other material which can cause deterioration.

C. Correct damage by repairing or replacing as directed by the Architect. Repairing will be permitted only where the repair is undetectable and does not cause structural damage or interfere with proper functioning of the part.

D. Protect finish of installed products until Substantial Completion of the Project by use of wrappings, covers or other approved protective devices. Remove such protection immediately prior to final cleaning.

E. Limiting Exposures: Coordinate and supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Maintain exposures within the manufacturers recommended limits. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading
2. Excessive internal or external pressure
3. Excessive high or low temperatures
4. Thermal shock
5. Excessively high or low humidity
6. Air contamination or pollution
7. Water or ice
8. Solvents
9. Chemicals

10. Light
11. Radiation
12. Puncture
13. Abrasion
14. Heavy traffic
15. Soiling, staining and corrosion
16. Bacteria
17. Rodent and insect infestation
18. Combustion
19. Electrical current
20. High speed operation
21. Improper lubrication
22. Unusual wear or other misuse
23. Contact between incompatible materials
24. Destructive testing
25. Misalignment
26. Excessive weathering
27. Unprotected storage
28. Improper shipping
29. Theft
30. Vandalism

F. Take precautions to protect existing concrete and asphalt pavement from damage due to vehicle loads, parking, and storage.

1. Schedule loading to minimize pavement material consolidation during hot weather. Distribute wheel loads to the greatest extent possible.

3.07 OVERHEAD ATTACHMENTS

A. Where overhead hangers are required, and not indicated on the drawings, provide one or more of the following as required:

1. Concrete inserts prior to placement of concrete or drilled type inserts after concrete is placed.
2. Trapeze from adjacent structure with suitable steel framing.
3. Connections to Structure: Suitable anchorage devices with a minimum load carrying capacity of 250 pounds plus safety factor of 4:1 for the applied load.
    a. Concrete: Steel expansion anchors. See Prohibited Material and Methods specified in Section 01 60 00.
    b. Steel: Bolted or welded connections to steel structure.

B. Where metal deck is furnished with hanger tabs or similar devices, applied total load, including work of other trades, not to exceed 75 pounds for each device. Loads in excess of permitted limit to be supported by trapeze framing as specified above.

C. Verify support requirements of heavy or unusual loads not specifically shown on

drawings with Architect.

3.08 OPERATION AND MAINTENANCE

A. Contractor shall maintain all systems and equipment operated during construction. The contractor responsible for the installation of the system shall operate and maintain it. Make all repairs and perform all maintenance to assure Work is turned-over to Owner in first class condition.

B. Maintenance work includes:

1. Lubrication
2. Adjustments
3. Filter replacements
4. Chemical treatment.

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 GENERAL

1.01 DESCRIPTION

A. Execute cutting, fitting or patching of Work, required to:

1. Make several parts fit properly.
2. Uncover Work to provide for installation of ill-timed Work.
3. Remove and replace defective Work.
4. Remove and replace Work not conforming to requirements of Contract Documents.
5. Remove samples of installed Work as specified for testing.
6. Install specified Work in existing construction.

B. In addition to contract requirements, upon written instructions of Architect:

1. Uncover Work to provide for Architect's observation of covered Work.
2. Remove samples of installed materials for testing.
3. Remove Work to provide for alteration of existing Work.

C. Do not endanger any Work by cutting or altering Work or any part of it.

1.02 SUBMITTALS

A. Prior to cutting which affects structural safety of Project, submit written notice to Architect, requesting consent to proceed with cutting, including:

1. Identification of Project.
2. Description of Affected Work.
3. Necessity for cutting.
4. Affect on other Work, on structural integrity of Project.
5. Description of proposed Work. Designate:
    a. Scope of cutting and patching.
    b. Contractor and trades to execute work.
    c. Products proposed to be used.
    d. Extent of refinishing.
6. Alternative to cutting and patching.

B. Should conditions of Work, or schedule indicate change of materials or methods, submit written recommendation to Architect, including:

1. Conditions indicating change.
2. Recommendations for alternative materials or methods.

3. Submittals as required for Substitutions.

C. Submit written notice to Architect, designating time Work will be uncovered, to provide observation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching of materials and surfaces shall be in accordance with the requirements of the Contract Documents. Where not otherwise defined, patching shall match adjacent surfaces and proper materials shall be provided accordingly.

PART 3 EXECUTION

3.01 INSPECTION

A. Inspect existing conditions of Work, including elements subject to movement or damage during cutting and patching.

B. After uncovering Work, inspect conditions affecting installation of new products.

3.02 PREPARATION PRIOR TO CUTTING

A. Provide shoring, bracing and support as required to maintain structural integrity of Project.

B. Provide protection for other portions of the Project, including all Contractors' personnel.

3.03 PERFORMANCE

A. Execute fitting and adjustment of products to provide finished installation to comply with specified tolerances, finishes.

B. Execute cutting and demolition by method which will prevent damage to other Work, and will provide surface to receive installation of repairs and new Work.

1. No cutting shall be performed which will, in any way, reduce the structural strength of the building. Should such cutting be necessary, consult Architect and do not proceed with such operation unless written approval is given.
2. Finished Surfaces: Cur or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

C. Restore Work which has been cut or removed; install new products to provide

completed Work in accord with requirements of Contract Documents.

D. Patching of materials and surfaces shall be in accordance with the requirements of the Contract Documents. Where not otherwise defined, patching shall match existing or adjacent surfaces and proper materials shall be provided accordingly.

1. Wherever existing walls, floors, ceilings, etc., are cut, the exposed surfaces must be neatly finished by patching, painting, wall covering, etc., as required to blend patched areas into adjacent existing surfaces. Patched areas shall not be visible when viewing entire wall surface.
   a. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
2. Where painting or finishing of patched surfaces or application of wall or floor covering is required, finish the entire plane of surface in which patched area occurs.
3. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

3.04 SLEEVES AND OPENINGS

A. Where pipes, conduits, ductwork or other materials pass through new walls, partitions, floors, roof or ceilings, provide suitable sleeves in these elements or provide openings where sleeves are not practical.

B. Close sleeves and openings to prevent passage of smoke or fire using approved methods and materials to maintain the fire rating of the construction being penetrated. See Section 07 84 00.

C. Where pipes, conduit, ductwork etc., pass through, behind, or above existing construction, provide all cutting, patching, and refinishing for doing this work as specified herein.

D. Lintels: Provide steel or precast concrete lintels to span openings in masonry walls sized in accordance with schedule shown or as detailed on structural drawings. In general, lintels are not required for openings less than the width of masonry unit in which wall is being constructed. Penetrations under beams or other concentrated loads require approval of Architect.

3.05 CLEANING

A. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

END OF SECTION

SECTION 02 41 19

SELECTIVE BUILDING DEMOLITION

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. Work Included: The extent of demolition work is indicated on drawings, and includes, but is not necessarily limited to, the following:

1. Selective breaking up, dismantling and/or removal of existing building items.
2. Salvage of selected existing materials to be turned over to Owner as may be determined by the Owner or to be reused in the project.
3. Cutting and patching.
4. Clean up.

B. Removal of asbestos and other hazardous materials is not a part of this Contract. If asbestos or other hazardous materials are encountered during demolition, Contractor shall halt demolition operations in that area and notify Architect.

1.02 RELATED SECTIONS

A. Cutting and Patching: Section 01 73 29.

1.03 PROJECT CONDITIONS

A. Condition of Structures: The Owner assumes no responsibility for actual condition of structures to be demolished.

1. Conditions existing at time of inspection for bidding purposes will be maintained by Owner insofar as practicable. However, variations within the structure may occur by Owner's removal and salvage operations prior to the start of the Demolition work.
2. It is solely the Contractor's responsibility to determine demolition procedure and sequence and to insure the safety of the building and its component parts during demolition. This includes the addition of whatever shoring, sheeting, temporary bracing, guys or tie-downs which might be necessary. Such material shall maintain the Contractor's property after completion of the project.
3. It is solely the Contractor's responsibility to follow all applicable safety codes and regulations during all phases of the work.
4. Existing Building: Provide temporary supports and other measures as required to prevent damage to the existing building during construction. Field verify all existing dimensions which affect the new construction.

B. Coordination

1. Demolition sequence, phasing and methods must be approved by Architect prior to start of demolition work.
2. Coordinate shoring with structural modifications. Shoring to be left in place until completion of structural work permits its removal.

C. Title to Removed Property

1. All removal items, unless otherwise indicated for salvage or reuse will become the property of the Contractor and shall be removed from the Site. During the demolition operations, Owner reserves the right to add to, or delete from, the list of items designated for reuse or salvage.
2. Items to be salvaged for the Owner or for reinstallation are as indicated on the drawings.
3. Site storage or sale of Contractor owned removed items will not be permitted.

D. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

E. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
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 the item functional for use indicated.

F. 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 cleaned and reinstalled in their original locations after selective demolition operations are complete.

G. Traffic: Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks and other adjacent occupied or used facilities.

1. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction.

H. Protections: Ensure safe passage of persons around area of demolition. Conduct operations to prevent injury to adjacent buildings, structures, other facilities, and persons.

I. Damages: Promptly repair damages caused to adjacent facilities by demolition operations at no cost to Owner.

J. Utility Services

1. Locate and identify electrical and mechanical services passing through or located within affected area and serving areas outside the work limits.
2. Maintain existing utilities and protect against damage during demolition operations.
3. Shut-down periods
   a. Arrange timing of shut-down periods of all in-service utilities with the Owner. Do not shut down any utility without prior written approval.
   b. Keep shut-down period to a minimum or use intermittent period as directed.

   c. Some shut-down hours may be required after normal working hours. No extra compensation will be made for Work after normal working hours, weekends or holidays.

K. Scheduling: Conduct work so as to avoid interference with operations and work in areas of building which are to remain in service.

L. Permits, Fees and Inspections: Obtain and pay for all permits, fees and inspections required by governing authorities.

PART 2 PRODUCTS

2.01 MATERIALS

A. The Contractor shall furnish all materials, tools, equipment, supplies and labor required to perform the work in accordance with the Drawings and Specifications and within the time limits as specified. All work done under this contract shall conform to all current standards, building codes and ordinances. American National Standard for Demolition Operations – Safety Requirements, ANSI A10.6 (latest edition), is included by reference.

B. Shoring Materials: As determined by Contractor.

PART 3 EXECUTION

3.01 PROTECTION

A. Use water sprinkling, temporary enclosures and other approved methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical

level. Comply with governing regulations pertaining to environmental protection.

1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, pollution and electrical shock.
2. Clean adjacent structures and improvements of dust, dirt and debris caused by demolition operations, as directed by the Architect. Return adjacent areas to conditions existing prior to the start of the work.

B. In removal of existing materials, take care not to damage work remaining in place, salvageable materials or equipment. Repair or replace any existing construction, materials or equipment damaged during demolition to Owner's satisfaction at no additional cost.

3.02 DEMOLITION

A. Building Items Demolition

1. General
   a. Items specified herein or indicated on drawings.
   b. Where indicated to be removed and either turned over to Owner or reinstalled, use methods for removal which will provide the least potential adjacent materials to remain.
   c. Miscellaneous Items: Material or equipment encountered during construction which must be removed to aid in construction operations or that which will not be used in completed facilities.
2. Concrete and Masonry: Where cut line will be exposed in the finished work and where physically feasible, make edges by saw cutting.
   a. Structural Reinforced Slabs and Walls: Field drilling of holes, cutting openings and rebar in any structural member, floor slab and load bearing wall is not permitted without written approval of the structural engineer. The Contractor shall be responsible for locating existing rebars in concrete and masonry walls and slabs by non-destructive means for review by the structural engineer.
3. New Door and Window Openings: Cut openings, install lintels and patch jambs and head as required to provide rough openings indicated on drawings.
4. Masonry: Demolish in small sections. Use bracing and shoring where necessary to avoid collapse of structure.
5. Removal of Masonry Units.
   a. Limits: As indicated on Drawings or as directed by Architect.
   b. Method.
      1) Remove to first full masonry unit beyond limits.
      2) Remove all old mortar from existing masonry units adjacent to new construction.
      3) Sufficiently brace opening when necessary until construction is completed.
6. Junction Points: Neatly repair the point of junction after removal of parts or all of masonry walls, slabs and like work which tie into new work or existing work, so as to leave only finished edges and surfaces exposed.
7. Except where Contract Documents require leaving an existing floor finish in

place, completely remove existing flooring from locations where new finishes are scheduled. Leave top surface of substrate completely free from materials that would interfere with bond of new materials.

8. Completely remove existing carpet from areas to receive new floor finishes. Also remove pad and all traces of adhesive.
9. Floor Preparation: See Section 01 73 00, Execution Requirements.
10. Salvage face brick and limestone resulting from demolitions operations. Take caution not to mix face brick with common brick. Neatly stack on pallets as directed by Construction Manager.
    a. Face Brick: Salvage, clean and store for reuse.
    b. Common Brick: Remove from site.
    c. Limestone: Salvage, clean and store for reuse. Remove existing surface applied anchorage where present.

B. Mechanical (HVAC & Plumbing)

1. Disconnect or shut off service to areas where mechanical work is to be removed.
2. Remove all plumbing, heating, ventilating and air conditioning equipment, fixtures and related piping, ductwork and appurtenances as indicated.

C. Electrical

1. Disconnect or shut off service to areas where electrical work is to be removed.
2. Remove all electrical fixtures, equipment and related switches, outlets, conduit, wiring and appurtenances as indicated, except conduit in walls and ceilings not being removed may remain. If these conduits are left in place, cut ends are to be permanently sealed.

3.03 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Remove from site, debris, rubbish and other materials resulting from demolition operations.

B. Removal: Transport materials removed and dispose of off site except as follows:

1. Transport material indicated to be "salvaged" to storage areas as directed by Architect. Storage areas are located on-site.
2. Store salvaged materials, protected from dirt and damage.

C. Clean Up

1. Leave interior areas "broom clean".
2. Remove barricades as directed.
3. Remove shoring.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

1.02 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, and other pozzolans materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at the project site.

1.04 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Aggregates.
6. Admixtures:
   a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
7. Vapor retarders.
8. Liquid floor treatments.
9. Curing materials.
10. Joint fillers.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.

3. Durability exposure class.
4. Maximum w/cm.
5. Slump limit.
6. Air content.
7. Nominal maximum aggregate size.
8. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
9. Intended placement method.
10. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.05 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Vapor retarders.
5. Joint-filler strips.

B. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Aggregates.
6. Admixtures:

C. Research Reports: For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.

D. Preconstruction Test Reports: For each mix design.

E. Field quality-control reports.

F. Minutes of preinstallation conference.

1.06 QUALITY ASSURANCE

A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

1.07 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.

1. Include the following information in each test report:
   a. Admixture dosage rates.
   b. Slump.
   c. Air content.
   d. Seven-day compressive strength.
   e. 28-day compressive strength.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.09 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1.
B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1.

PART 2 - PRODUCTS

2.01 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.02 CONCRETE MATERIALS

A. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I
2. Fly Ash: ASTM C618, Class C or F.

B. Normal-Weight Aggregates: ASTM C33/C33M, coarse aggregate or better, graded. Provide aggregates from a single source.

1. Alkali-Silica Reaction: Comply with one of the following:
   a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
   b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
   c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. (2.37 kg/cu. m) for moderately reactive aggregate or 3 lb./cu. yd. (1.78 kg/cu. m) for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301 (ACI 301M).
2. Maximum Coarse-Aggregate Size: 1 inch, 3/4 inch for ICF walls
3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Air-Entraining Admixture: ASTM C260/C260M.

D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
   2. Retarding Admixture: ASTM C494/C494M, Type B.
   3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
   5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

E. Water and Water Used to Make Ice: ASTM C94/C94M, potable.

2.03 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

   1. Floor treatments shall be compatible with floor finishes including but not limited to concrete color stains and polishing treatments.

2.04 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

   1. Color:
      a. Ambient Temperature Below 50 deg F (10 deg C): Black.
      b. Ambient Temperature between 50 deg F (10 deg C) and 85 deg F (29 deg C): Any color.
      c. Ambient Temperature Above 85 deg F (29 deg C): White.

C. Curing Paper: Eight-feet- (2438-mm-) wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.

D. Water: Potable or complying with ASTM C1602/C1602M.

E. Clear, Waterborne, Membrane-Forming, UV Dissipating Curing Compound: by WR Meadows, Dayton or equivalent

   1. Curing compounds shall be compatible with floor finishes including but not limited to concrete color stains and polishing treatments.

F. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

2.05 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork

2.06 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash or Other Pozzolans: 25 percent maximum by mass. 20 percent maximum or as specified by the stain manufacturer for concrete slabs which are specified to be stained.
2. Total of Fly Ash or Other Pozzolans: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass. 20 percent maximum or as specified by the stain manufacturer for concrete slabs which are specified to be stained.
3. Total of Fly Ash or Other Pozzolans: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass. 20 percent maximum or as specified by the stain manufacturer for concrete slabs which are specified to be stained.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

1. Use water-reducing high-range water-reducing plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete.

2.07 CONCRETE MIXTURES

A. Class A: Normal-weight concrete used for footings.

1. Exposure Class: ACI 318 F0
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Maximum w/cm: 0.45
4. Minimum Cementitious Materials Content: 520 lb/cu. yd.
5. Slump Limit: 4 inches , plus or minus 1 inch, 7 inches max for water-reducing admixture or plasticizing admixture

6. Limit water-soluble, chloride-ion content in hardened concrete to 0.05 percent by weight of cement.

B. Class C: Normal-weight concrete used for interior slabs-on-ground, slab on deck.

1. Exposure Class: ACI 318 F0
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Maximum w/cm: 0.45
4. Minimum Cementitious Materials Content: 520 lb/cu. yd.
5. Slump Limit: 4 inches plus or minus 1 inch , 7 inches max with water-reducing admixture or plasticizing admixture
6. Air Content:
   a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
7. Limit water-soluble, chloride-ion content in hardened concrete to 0.05 percent by weight of cement.

C. Class D: Normal-weight concrete used for exterior slab on grade.

1. Exposure Class: ACI 318 F3
2. Minimum Compressive Strength: 4500 psi at 28 days.
3. Maximum w/cm: 0.45.
4. Minimum Cementitious Materials Content: 520 lb/cu. yd.
5. Slump Limit Slump Limit: 4 inches plus or minus 1 inch , 7 inches max with water-reducing admixture or plasticizing admixture
6. Air Content:
   a. Exposure Classes F2 and F3: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size. 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch nominal maximum aggregate size
7. Limit water-soluble, chloride-ion content in hardened concrete to 0.05 percent by weight of cement.

2.08 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and furnish batch ticket information.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd. increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time,

quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.01 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.02 INSTALLATION OF VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
2. Face laps away from exposed direction of concrete pour.
3. Lap vapor retarder over footings and grade beams not less than 6 inches sealing vapor retarder to concrete.
4. Lap joints 6 inches and seal with manufacturer's recommended tape.
5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
7. Protect vapor retarder during placement of reinforcement and concrete.
    a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

3.03 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
2. Place joints perpendicular to main reinforcement.
    a. Continue reinforcement across construction joints unless otherwise indicated.

b. Do not continue reinforcement through sides of strip placements of floors and slabs.

3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least of concrete thickness as follows:

1. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints:

1. Install dowel bars and support assemblies at joints where indicated on Drawings.
2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint
.

F. Dowel Plates: Install dowel plates at joints where indicated on Drawings.

3.04 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer in writing, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
    a. Do not use vibrators to transport concrete inside forms.
    b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
    c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
    d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Do not place concrete floors and slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

3.05 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 (ACI 301M) Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.

a. Patch voids larger than 1-1/2 inches (38 mm) wide or 1/2 inch (13 mm) deep.
b. Remove projections larger than 1 inch (25 mm).
c. Tie holes do not require patching.
d. Surface Tolerance: ACI 117 (ACI 117M) Class D.
e. Apply to concrete surfaces not exposed to public view.

2. ACI 301 (ACI 301M) Surface Finish SF-2.0:
   a. Patch voids larger than 3/4 inch (19 mm) wide or 1/2 inch (13 mm) deep.
   b. Remove projections larger than 1/8 inch (3 mm).
   c. Patch tie holes.
   d. Surface Tolerance: ACI 117 (ACI 117M) Class A.
   e. Locations: Apply to concrete surfaces exposed to public view, to receive a rubbed finish or to be covered with a coating or covering material applied directly to concrete.

B. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.06 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish:

1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch (6 mm) in one direction.
3. Apply scratch finish to surfaces where finishes require a scratch coat.

C. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete. See sheet S0.0 for slab flatness and levelness requirements
3. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo

D. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to surfaces exposed to view to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
7. Finish and measure surface to comply with ACI 117 tolerances for conventional concrete. See sheet S0.0 for slab flatness and levelness requirements.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.

1. Coordinate required final finish with Architect before application.
2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
2. Coordinate required final finish with Architect before application.

3.07 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the 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:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.

2. Construct concrete bases 4 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4000 psi at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices.
    a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    b. Cast anchor-bolt insert into bases.
    c. Install anchor bolts to elevations required for proper attachment to supported equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.

1. Cast-in inserts and accessories, as shown on Drawings.
2. Screed, tamp, and trowel finish concrete surfaces.

3.08 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 (ACI 301M) and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M) for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h (1 kg/sq. m x h), calculated in accordance with ACI 305.1,) before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 (ACI 308.1M) as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
3. If forms remain during curing period, moist cure after loosening forms.
4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
    a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
    b. Continuous Sprinkling: Maintain concrete surface continuously wet.
    c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.

d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
1) Recoat areas subject to heavy rainfall within three hours after initial application.
2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 (ACI 308.1M) as follows:

1. Begin curing immediately after finishing concrete.
2. Interior Concrete Floors:
a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
a) Lap edges and ends of absorptive cover not less than 12-inches (300-mm).
b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive.
a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
b) Cure for not less than seven days.

3) UV Dissipating Water-Based Curing Compound:

a) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
b) Recoat areas subjected to heavy rainfall within three hours after initial application.
c) Maintain continuity of coating, and repair damage during curing period.
d) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

a) Lap edges and ends of absorptive cover not less than 12 inches (300 mm).
b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive.
a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
b) Cure for not less than seven days.

3) UV Dissipating Water-Based Curing Compound:

a) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
b) Recoat areas subjected to heavy rainfall within three hours after initial application.
c) Maintain continuity of coating, and repair damage during curing period.
d) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

c. Floors to Receive Polished Finish By Grinding and/ or Chemical Stain:
1) UV Dissipating Water-Based Curing Compound:

a) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
b) Recoat areas subjected to heavy rainfall within three hours after initial application.
c) Maintain continuity of coating, and repair damage during curing period.
d) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

d. Floors to Receive Curing and Sealing Compound:
1) Apply uniformly to floors and slabs indicated in a continuous operation by roller in accordance with manufacturer's written instructions.
2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.09 TOLERANCES

A. Conform to ACI 117. See structural drawings sheet

3.10 APPLICATION OF LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment in accordance with manufacturer's written instructions.
   1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
   2. Do not apply to concrete that is less than 28 days' old.
   3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.
   4. Rinse with water; remove excess material until surface is dry.
   5. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller in accordance with manufacturer's written instructions.

3.11 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

   1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
   2. Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
   3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
      a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
         1) Project name.
         2) Name of testing agency.
         3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
         4) Name of concrete manufacturer.
         5) Date and time of inspection, sampling, and field testing.
         6) Date and time of concrete placement.
         7) Location in Work of concrete represented by samples.
         8) Date and time sample was obtained.
         9) Truck and batch ticket numbers.
         10) Design compressive strength at 28 days.
         11) Concrete mixture designation, proportions, and materials.
         12) Field test results.

13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
14) Type of fracture and compressive break strengths at seven days and 28 days.

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

D. Inspections:

1. Headed bolts and studs.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.
5. Verification of concrete strength before removal of shores and forms from beams and slabs.
6. Batch Plant Inspections: On a random basis, as determined by Architect.

E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
   a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C143/C143M:
   a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   b. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;
   a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C1064/C1064M:
   a. One test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.
   a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C31/C31M:
   a. Cast and laboratory cure two sets of three 6-inch (150 mm) by 12-inch (300 mm) (200 mm) cylinder specimens for each composite sample.

b. Cast, initial cure, and field cure two sets of three standard 6-inch (150 mm) by 12-inch cylinder specimens for each composite sample.

7. Compressive-Strength Tests: ASTM C39/C39M.
   a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days.
   b. Test one set of two field-cured specimens at seven days and one set of two specimens at 28 days.
   c. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa) if specified compressive strength is 5000 psi (34.5 MPa), or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi (34.5 MPa).
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests:
    a. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
    b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
       1) Acceptance criteria for concrete strength shall be in accordance with ACI 301 (ACI 301M), section 1.6.6.3.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 (ASTM E1155M) within 24 hours of completion of floor finishing and promptly report test results to Architect.

3.12 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.

5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION

SECTION 04 00 00

MASONRY

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide the following:

1. Face brick installation.
2. Concrete masonry units and patching.
3. Limestone cap.
4. Mortar and grout.

1.02 SUBMITTALS

A. Product Data: For each different masonry unit, accessory and other manufactured products specified.

B. Shop Drawings: Show fabrication and installation details for the following:

1. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples: Provide samples of items specified herein to be used in the work.

D. Submit certification that fire resistant concrete units conform to the requirements specified herein for Fire Resistant Concrete Block.

E. Brick Cleaner

1. Applicator Qualifications: Submit qualifications of applicator.
   a. Certification stating applicator is experienced in the application of the specified products.

   b. List of recently completed masonry cleaning projects, including project name and location, names of owner and Architect, description of cleaning products used and substrates, applicable local environmental regulations, and application procedures.
2. Environmental Regulations: Submit description for testing, handling, treatment, containment, collection, transport, disposal, and discharge of hazardous wastes and cleaning effluents. Describe any hazardous materials to be cleaned from substrates. Submit applicable local environmental regulations.
3. Protection: Submit description for protecting surrounding areas, landscaping, building occupants, pedestrians, vehicles, and nonmasonry surfaces during the work from contact with masonry cleaners, stain

removers, residues, rinse water, fumes, wastes, and cleaning effluents.

4. Surface Preparation: Submit description for surface preparation of substrates to be completed before application of masonry cleaners and stain removers.
5. Application: Submit description for application procedures of masonry cleaners.

F. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated.

1. Each type of masonry unit required.
   a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
   b. Include test results, measurements, and calculations establishing net-area compressive strength of masonry units.
2. Mortar complying with property requirements of ASTM C270.
3. Grout mixes complying with compressive strength requirements of ASTM C476. Include description of type and proportions of grout ingredients.

G. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:

1. Each type of masonry unit required.
   a. Include test data, measurements, and calculations establishing net-area compressive strength of masonry units.
2. Each combination of masonry unit type and mortar type. Include statement of net-area compressive strength of masonry units, mortar type, and net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
3. Each material and grade indicated for reinforcing bars.
4. Each type and size of joint reinforcement.
5. Each type and size of anchor, tie, and metal accessory.

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

1.05 QUALITY ASSURANCE

A. Supervisor: A supervisory journeyman mason shall be appointed for the project and shall be present at all times masonry work is being performed and:

1. have a minimum of 5 years experience on masonry projects of this type and size.
2. be thoroughly familiar with the design requirements, types of materials being installed, referenced standards and other requirements.

B. Use only skilled journeyman masons for cutting and placing of masonry; no allowance shall be made for lack of skill on the part of the workmen.

C. Consult other trades and make provisions that shall permit the installation of their work in a manner to avoid cutting and patching. Build-in work under other sections, as necessary, and as the work progresses.

D. Unit Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602, 2013 Edition "Specifications for Masonry Structures". Maintain one copy of the standard in project field office at all times during construction. Contractor's supervisory personnel shall be thoroughly familiar with the material as it applies to this Project.

E. Concrete Unit Masonry Construction: Comply with the National Concrete Masonry Association (NCMA) "TEK Bulletins", and other requirements specified.

1. NCMA TEK Bulletin 3-02A "Grouting for Concrete Masonry Walls".
2. NCMA TEK Bulletin 8-02A "Removal of Stains from Concrete Masonry Walls".
4. NCMA TEK Bulletin 10-01A "Crack Control in Concrete Masonry Walls".
5. NCMA TEK Bulletin 10-02C "Control Joints for Concrete Masonry Walls".
6. NCMA TEK Bulletin 14-2 "Reinforced Concrete Masonry".
7. NCMA TEK Bulletin 19-04A "Flashing Concrete Masonry".
8. NCMA TEK Bulletin 19-05A "Use of Flashing in Concrete Masonry Walls".

F. Brick Industry Association (BIA)

1. BIA Technical Notes No. 8 and 8B: Mortar for Brickwork.
2. BIA Technical Notes No. 20: Cleaning Brick Masonry.
3. BIA Technical Notes No. 28D: Brick Veneer.
4. BIA Technical Notes No. 18A: Expansion of Brickwork.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store cement and lime materials and masonry units off the ground, under cover and protected from weather damage. If units become wet, do not install until they are dry. Do not use cementitious materials that have become damp.

C. Stockpile and store aggregates to prevent contamination from foreign materials, in locations where grading and other required characteristics can be maintained.

D. Use care in handling units to avoid chipping and breakage.

E. Locate storage areas where they will not be disturbed or damaged by construction operations.

F. Protect finished floor areas from damage.

1.07 COLD WEATHER CONSTRUCTION

A. Comply with recommended practices for cold weather construction of the International Masonry Industry All-Weather Council and requirements contained in ACI 530.1/ASCE 6/TMS 602.

B. Do not build on frozen or snow covered work. Remove and replace masonry work damaged by frost or freezing.

C. Requirements During Construction: Provide the following minimum requirements for the air temperatures listed:

1. Above 40° F: Normal masonry procedures.
2. 40° F to 32° F: Heat mixing water to produce mortar temperatures between 40° F and 120° F. Produce consecutive batches of mortar with the same temperatures falling within this range. Do not heat mortar to greater than 120° F.
3. Below 32° F to 25° F: Heat sufficient mortar ingredients to produce mortar temperatures between 40° F and 120° F. Produce consecutive batches of mortar with the same temperatures falling within this range. Maintain mortar temperatures after mixing above 40° F. Do not heat mortar to greater than 120° F.
4. Below 25° F to 20° F: Heat sufficient mortar ingredients to produce mortar temperatures between 40° F and 120° F. Produce consecutive batches of mortar with the same temperatures falling within this range. Maintain mortar temperatures after mixing above 40° F. Do not heat mortar to greater than 120° F. Maintain masonry above freezing using auxiliary heat. Provide enclosure when wind is in excess of 15 mph.
5. Below 20° F: Heat sufficient mortar ingredients to produce mortar temperatures between 40° F and 120° F. Produce consecutive batches of mortar with the same temperatures falling within this range. Maintain mortar temperatures after mixing above 40° F. Do not heat mortar to greater than 120° F. Maintain masonry above freezing using enclosure and auxiliary heat.

D. Protection Requirements for Completed Masonry (and masonry not being worked on): Provide the following minimum requirements for the mean daily air temperatures listed:

1. Above 40° F: Normal masonry procedures.
2. 40° F to 32° F: Protect from rain or snow for 24 hours with weather-resistive membrane.
3. Below 32° F to 20° F: Completely cover with weather-resistive membrane and maintain above freezing for 24 hours.
4. Below 20° F: Provide weather-resistant enclosure and auxiliary heat to maintain above freezing for 24 hours.

E. Requirements During Grouting Operations (Vertically Reinforced Walls): Provide the following minimum requirements for the air temperatures listed:

1. Above 32° F: Normal masonry procedures. Cover at end of work day with weather-resistive membrane.
2. 32° F to 20° F: Heat grout materials to 90° F so grout has in-place

temperature of 70° F at end of work day. Cover at end of work day with weather-resistive membrane and 1/2" thick insulating blanket.

3. Below 20° F: Heat grout materials to 90° F so grout has in-place temperature of 70° F at end of work day. Cover at end of work day with weather-resistive membrane and 1" thick insulating blanket or maintain heated enclosure to 40° F for a period of 48 hours.
   a. Grout Containing Type III Cement: Maintain 40° F temperature for 24 hours.

1.08 HOT WEATHER CONSTRUCTION

A. Protect masonry construction from direct exposure to wind and sun when erected in an ambient air temperature of 90° F., or greater in shade with relative humidity less than 50%. Provide artificial shade and wind breaks and use cooled materials as required. Provide artificial shade, wind breaks, use cooled materials and other procedures outlined in BIA Tech Notes #1.

1.09 PROJECT CONDITIONS

A. 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.

1. Brace unsupported and newly laid masonry walls. Maintain bracing in place until building structure provides permanent bracing.

B. 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 become in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread 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 on completed masonry.

PART 2 PRODUCTS

2.01 CLAY MASONRY UNITS

A. Brick: New pier where indicated with face brick to match existing.

2.02 CONCRETE MASONRY UNITS

A. General

1. Curing: Cure for at least 7 days and units must be at least 28 days old when used in the work.
2. Corners (Interior Walls): Provide bullnose edges at all outside corners unless otherwise indicated or directed.

3. Integral Water Repellents: Use in units exposed to weather. Amount as recommended by water repellent manufacturer as approved by concrete block manufacturer.
    a. Type: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
    b. Products/Manufacturers: Subject to compliance with requirements, provide W. R. GRACE Dry-Block; MASTER BUILDERS' INC. Rheomix-Rheopel; ACME-HARDESTY CO. Acme-Shield; KRETE INDUSTRIES KreteControl 202 Internal Water Repellent; EUCLID CHEMICAL Hydrapel System.

B. Hollow Load Bearing, Solid Load Bearing (75%) and Fire Resistant Concrete Masonry Units

1. Type: Hollow, load bearing, standard modular size and shapes, thoroughly cured and dried.
2. References: ASTM C90.
3. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
4. Weight Classification: Normal weight, unless otherwise indicated.
5. Linear Shrinkage: Not to exceed 0.065 percent, ASTM C426.
6. Aggregate: ASTM C33 normal weight aggregates. Cinder aggregates not permitted.
7. Fire Resistant
    a. Rating: Design for fire ratings indicated on drawings.
    b. Manufacturer
        1) Listed in the Building Materials List published by the Underwriters' Laboratories, Inc.
        2) In lieu of above, provide a report from a nationally recognized testing agency stating that the units are equivalent in fire rating to those furnished by the producers as listed above.
    c. Location: Where indicated.

2.03 LIMESTONE MATERIALS

A. Limestone: Indiana (Oolitic) limestone complying with ASTM C568, Category II (medium density) with physical characteristics specified.

1. Absorption: ASTM C97, 7.5% maximum.
2. Compressive Strength: ASTM C170, 4,000 psi minimum.
3. Modulus of Rupture: ASTM C99, 500 psi minimum.

B. Provide fine grade limestone with smooth finish, color to match existing.

C. Provide only sound stone, free from mineral stains or other foreign matter.

2.04 MORTAR

A. Materials

1. Portland Cement: ASTM C150, 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 or selected.
2. Masonry Cement: ASTM C91, provide non-staining type for stonework.
3. Hydrated Lime: ASTM C207, Type S.
4. Aggregate: ASTM C144, clean masonry sand, not over 10% to pass No. 100 sieve for general use.
5. Water: Clean, fresh and free of deleterious amounts of acids, alkalis and foreign organic matter.
6. Water Repellent Admixture: W. R. GRACE Dry-Block, RHEOMIX - Rheopel Mortar Admixture; MASTER BUILDERS, INC., KRETE INDUSTRIES KreteGuard 390. Manufacturer must submit certification that water repellent admixture meets or exceeds requirements specified herein.
   a. Conformance: ASTM E514.
   b. Type: Integral polymeric water-repellents (IPWR).
7. Color Additive: Inorganic pigments as required to produce colored mortar as selected by Architect. SGS Colors by SOLOMON GRIND CHEM SERVICE; DAVIS COLORS or equal.
   a. Resistant to alkali, light and weather
   b. Unaffected by cement and free of water soluble salts.
8. Cold Weather Additive: Non-chloride, non-corrosive, accelerating admixture complying with ASTM C494, Type C or ASTM C1384 and recommended by the manufacturer for use in masonry mortar of composition indicated.

B. Proprietary Mortar Cement: Conform to ASTM C91, containing hydrated lime.

1. Certification: Submit certified laboratory data substantiating conformance with structural requirements for mortars as specified; and that no adverse chemical reaction will occur with the specified masonry accessories and reinforcing. Certification must be received and approved by Architect prior to mortar use.
2. Suitable products are acceptable from the following manufacturers:
   a. MIAMI
   b. LEHIGH HANSON
   c. ESSROC MATERIALS, INC. (Brixment)
   d. QUIKRETE
   e. CEMEX INC.

C. Mixes - Unit Masonry

1. Provide water repellent admixture in all mortar used for exterior CMU masonry work. Add to mix in accordance with manufacturer's recommendations.
2. Type M Mortar
   a. Use: Provide for CMU work below grade or in contact with earth.
   b. Proportions: ASTM C270 proportions by volume. Minimum average compressive strength at 28 days of 2,500 psi.
   c. Color: Natural color.
3. Type S Mortar
   a. Use: Provide for all CMU work.
   b. Proportions: ASTM C270 proportions by volume. Minimum average compressive strength at 28 days of 1,800 psi.

4. Type N Mortar
   a. Use: Provide for brick veneer
   b. Proportions: ASTM C270 proportions by volume. Minimum average compressive strength at 28 days of 750 psi.
   c. Colors: As selected by Architect.

2.05 GROUT

A. Masonry Grout - Mix

1. Fine Grout for Reinforced Masonry: Mix with mechanical mixer with sufficient water to the desired consistency in accordance with ASTM C476 Proportion Specifications.
   a. Portland Cement: 1 part
   b. Hydrated Lime: 0 to 1/10 part
   c. Fine Aggregate: 2-1/4 to 3 times the sum of the volumes of the cementitious materials
2. Coarse Grout for Reinforced Masonry: Mix with mechanical mixer with sufficient water to the desired consistency in accordance with ASTM C476 Proportion Specifications.
   a. Portland Cement: 1 part
   b. Hydrated Lime: 0 to 1/10 part
   c. Fine Aggregate: 2-1/4 to 3 times the sum of the volumes of the cementitious materials.
   d. Coarse Aggregate: 1 to 2 times the sum of the volumes of the cementitious materials.
3. Hand Mixing: Not acceptable.

2.06 MISCELLANEOUS ITEMS

A. Brick Cleaning Compound: PROSOCO Sure Klean 600 Detergent; or equal commercial cleaning solution by NATIONAL CHEMSEARCH or AMERICAN CALMAL that will not harm masonry or adjacent materials and is acceptable to the masonry manufacturer. Cleaners containing muriatic acid are not acceptable.

2.07 FABRICATION

A. Fabricate stone work in accordance with recommendations of the Indiana Limestone Institute (ILI).

B. Cut accurately to shape and dimensions indicated accepted on final shop drawings maintaining fabrication tolerances of ILI.

C. Cut Stone: Dress joints, bed and vertical, straight and at 90° angle to face.

1. Provide drips at all overhangs.
2. Thickness: Provide thickness to match existing.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine the substrates, structure, and installation conditions. Do not proceed with unit masonry work until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Brick

1. Wet brick having ASTM C67 absorption rates greater than 0.025 oz. per square inch per minute. Use wetting methods which ensure that each masonry unit is nearly saturated, but surface dry when laid. During freezing weather, comply with the recommendations of BIA.
2. Except for absorbent units specified to be wetted, lay masonry units dry.

B. Concrete Masonry Units: Lay masonry units dry. Do not wet concrete masonry units.

C. Establish lines, levels, and coursing.

3.03 INSTALLATION - GENERAL

A. Build pier to the dimension shown.

B. Cut masonry units using motor-driven masonry saws to provide clean, sharp, unchipped edges. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full-size units without cutting wherever possible. Provide 100% solid units where webs would be exposed.

C. Construction Tolerance: Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:

1. For conspicuous vertical lines, such as external corners do not vary from plumb by more than ¼" maximum.

2. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8", with a maximum thickness limited to ½". Do not vary from bed-joint thickness of adjacent courses by more than 1/8".
3. For exposed head joints, do not vary from thickness by more than plus or minus 1/8". Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8".

3.04 ERECTION - BRICK AND CONCRETE MASONRY

A. Masonry

1. Layout walls in advance for accurate spacing of surface bond patterns, with uniform joint widths, and to properly locate returns and offsets. Avoid the use of less than half-size units at corners, jambs and other locations.
2. Lay up walls plumb and true to comply with specified tolerance. Provide courses level, accurately spaced and coordinated with other work.
3. Pattern Bond: Lay exposed masonry in running bond with vertical joint in each course centered on units in courses above and below. Bond and interlock each course of each wythe at corners. Do not use units with less than 4" of horizontal face dimensions at corners.
4. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and slabs. Maintain 3/8" joint widths, except for minor variations required to maintain bond alignment.
5. Joints
   a. Exposed: Cut flush and finish (tool) with hardened metal tool to form a concave compressed joint. Same methods and types of tools to be used by all masons working on project.
   b. Concealed: Cut flush and trowel point.
6. Compress and cut joints flush for masonry foundation walls.
7. Lay brick masonry units with completely filled bed and head joints. Butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.

3.05 MORTAR

A. General

1. Batch Size: Controlled so that all material used within two (2) hours.
2. Mortar on Board
   a. Keep well tempered with water so long as its cementing material has not started to set.
   b. Do not retemper if initial set of cementing material has been reached, or if mortar has stiffened greatly.
3. Anti-freeze Admixture: Not permitted.
4. Water Repellent Admixture: Use with brick and concrete block exposed to exterior, mix as recommended by manufacturer.

B. Mixing

1. Machine mix dry in a batch mixer with care taken in adding water to mix to avoid overwetting.
2. Do not retamper in mixer at any time.
3. Continue mixing for a minimum of five (5) minutes after all materials are in mixer.

C. Recharging: Completely empty and clean mixer before recharging.

3.06 PROTECTION

A. Brace pier while in green condition.

B. Protection of Masonry: During construction, cover tops of pier 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 one wythe of multiwythe 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.

3.07 REPAIR, POINTING AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged. Provide new units to match adjoining units and install in fresh mortar pointed to eliminate evidence of replacement.

B. During the tooling of joints, enlarge all voids or holes, and completely fill with mortar. Point up all joints at corners to provide a neat, uniform appearance.

C. Cleaning - Brick Masonry: Clean all exposed brick masonry. Cleaning agents and methods subject to Architect's approval. Protect all stone. Damaged materials and work replaced at Contractor's expense.

1. Before full-scale application, review manufacturer's product data sheets to determine the suitability of each product for the specific surfaces. Apply each masonry cleaner to test panel areas to determine dilution rates, dwell times, number of applications, compatibility, effectiveness, application procedures, effects of pressure rinsing, and desired results.
2. Apply masonry cleaners and stain removers to test panels in accordance with manufacturer's written instructions. Allow 48 hours or until test panels are thoroughly dry before evaluating final appearance and results. Do not begin full-scale application until test panels are inspected and approved by the Architect.
3. Test Area Requirements:
   a. Size: Minimum 5 feet by 4 feet each.
   b. Locations: As determined by the Architect.

c. Masonry Cleaners: Number of test panels as required to completely test each masonry cleaner with each type of substrate to be cleaned.

4. Test all cleaning effluents generated by the masonry cleaning of the test panels to determine any hazardous characteristics. Comply with applicable federal, state, and local environmental regulations including testing, handling, treatment, containment, collection, transport, disposal, and discharge of hazardous wastes.

5. Muratic acid cleaning of brick masonry not permitted. Install and protect installed brick masonry so that acid cleaning is not required at completion of the work.

D. Cleaning – Concrete Masonry: During construction of exposed CMU, minimize mortar and grout smears on exposed surfaces. Dry brush CMU surfaces at the end of each days work and after final pointing. Remove mortar stains and dirt from exposed surfaces.

1. Cleaning Solutions: Where cleaning solutions are required, they shall be provided at no additional cost to the Owner. Cleaning solutions must be approved by Architect and spot tested prior to use.

E. Area Cleaning: Clean floors of all mortar droppings, including floor surfaces of accessible chases.

END OF SECTION

SECTION 05 70 00

DECORATIVE METALS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all miscellaneous ornamental metal items specified hereunder, including all design, materials, fabrication, fastenings and accessories required for finished installations, where indicated on drawings or otherwise necessary for completion of the project. Work includes, but is not limited to, the following:

a. Decorative picket railing system to match existing.

1.02 REFERENCE STANDARDS

A. The following publications of the issues listed below, but referred to hereinafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1. Aluminum Association
   a. Aluminum Standards and Data.
   b. Designation System for Aluminum Finishes.
   c. Standards for Anodic Finishes.
2. American Society for Testing and Materials (ASTM): Specifications listed herein.
   a. A167 Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
   b. A743 Castings, Iron Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application.
   c. A312 Seamless and Welded Austenitic Stainless Steel Pipe.
3. National Association of Architectural Metal Manufacturers.
4. American Welding Society (AWS)
   a. D1.1 Structural Welding Code - Steel.
   b. D1.3 Structural Welding Code - Sheet Steel.
5. American Institute of Steel Construction (AISC): "Manual of Steel Construction".
6. AWI: Architectural Woodwork Institute.
   a. Section 800: Stairwork and Handrails.
7. NOMMA: National Ornamental and Miscellaneous Metals Association.

1.03 SUBMITTALS

A. Product Data: Manufacturer's literature may be submitted for standard proprietary products in lieu of shop drawings. Data to fully explain product indicating materials, sizes and finishes, and installation procedures.

B. Samples: Samples to be reviewed for color, texture and reflectivity and general appearance. Compliance with all other requirements is the responsibility of the Contractor.

1. Finish: Submit for approval minimum 6" x 6" or 12" length of each required metal finish.
2. Sample: Submit a 2'-0" long sample of completed rail system.

C. Shop Drawings: Show details of fabrication and installation. Indicate materials, alloys and tempers, thicknesses of materials, gages, sizes, dimensions, methods of joining and fastening, welds, finishes, details of reinforcement and embedment, attachments, anchorages, miscellaneous metal items incidental to basic fabrication shown, provisions for work of other trades and other pertinent information as requested by the Architect.

D. Maintenance Instructions: Submit manufacturers'/fabricators' recommendations for maintenance of exposed finishes.

E. Certifications: Submit certifications that products comply with applicable design loadings. Include structural analysis data sealed and signed professional engineer responsible for their preparation.

F. Welder Certifications: Qualify welding process and welders in accordance AWS Codes referenced herein.

1. Certify that each welder has successfully passed AWS qualification tests for the welding processing involved and, if pertinent, has undergone recertification.

G. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.

1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Fabricator must have a minimum of 5 years experience and be regularly engaged in type of work specified. Must employ only skilled personnel using proper equipment to produce the work in high quality. Must be approved by Architect.

B. Installer Qualifications: Fabricator of products.

C. Single Source Responsibility: Stairs, handrails and railing systems shall be designed, fabricated and installed by the same source.

D. Engineering Responsibility: Stair engineering to be performed by a qualified professional engineer legally authorized to practice in the State of [Ohio],

experienced in this type of work.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide materials which have been selected for their surface flatness, smoothness and freedom from surface blemishes where exposed to view in the finished unit. Exposed-to-view surfaces which exhibit pitting, seam marks, roller marks, "oil-canning", stains, discolorations or other imperfections on finished units will not be acceptable.

B. Aluminum - Material and Description: Provide as detailed or as required to maintain design intent as indicated on drawings. Aluminum extruded shapes and bent aluminum sheet, minimum 0.063", unless otherwise indicated or specified, finished after fabrication.

1. Extruded Bar and Tube: ASTM B221 (ASTM B 221M), alloy 6061-T6/T62, Fy = 35 ksi.
2. Extruded Structural Pipe and Tube: ASTM B221, alloy 6061-T6/T62, Fy = 35 ksi.
3. Plate and Sheet: ASTM B 209 (ASTM B 209M), 6061-T6.

C. Stainless Steel

1. Type: Type 302/304 except items exposed to exterior or high moisture conditions to be Type 304.
2. Bar Stock: ASTM A743
3. Plate: ASTM A167.
4. Tubing: ASTM A269, seamless steel tubing.

D. Fasteners: Provide fasteners of types as required for assembly and installation of fabricated items. In general, fasteners to be concealed from view. Exposed fasteners, where permitted or required, to conform to the following:

1. Fasteners to be of basic metal and alloy, matching finished color and texture as metal being fastened, unless otherwise indicated.
2. Provide Phillips flat head screw/bolts for exposed fasteners.

E. Miscellaneous Materials: Provide all incidental accessory materials, tools, methods and equipment required for fabrication and installation of metal items as indicated on drawings, and not furnished by other sections.

2.02 FABRICATION

A. Preliminary: Verify dimensions prior to fabrication.

B. Forming: Form metal items to accurate sizes and configurations as indicated on drawings and otherwise required for proper installation. Make with all lines straight

and angles sharp, clean and true. Drill, countersink, tap and otherwise prepare items for connections with work of other trades as required.

C. Fasteners: Make permanent connections with work of other trades, as required. Avoid using exposed bolts or screws unless specifically indicated or approved.

D. Joints: Construct items with joints milled to a tight, hairline fit. Cope or miter corner joints. Where exposed to weather, form to exclude water.

E. Cut, reinforce, drill and tap miscellaneous metal as indicated to receive hardware, screws, and similar items. Countersunk screw holes to set screw heads flush, unless indicated otherwise.

2.03 ASSEMBLIES

A. Railings

1. Design to meet NAAMM standards and requirements of applicable codes, but not less than 200 lbs. applied at any point in any direction.
2. Shop fabricated with minimum field splicing allowed.
   a) All construction welded per AWS.
   b) Welds, where shown, to be continuous. Grind and add weld as required to provide uniform and smooth transition between pieces. Buff, polish and blend as required to match finish of railing.
3. Finish: As specified under Shop Finish herein.

2.04 SHOP FINISHES

A. Protect mechanical finishes on exposed surfaces from damage by application of strippable, temporary protective covering prior to shipment.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are not acceptable if they are noticeable variations in the same piece. Variations in appearance of other components are acceptable, subject to Architect's approval.

C. Aluminum Surfaces

1. Shop paint aluminum surfaces with baked-on organic polymer thermosetting powder coating applied over conversion coating.
2. Finish Coating Properties
   a. Hardness: H or better in accordance with ASTM D3363.
   b. Crosshatch Adhesion: In accordance with ASTM D3359.
   c. Salt Spray Resistance: 1,000 hours, tested in accordance with ASTM D117.
   d. Humidity Resistance: 1,000 hours tested in accordance with ASTM D2247.
   e. Detergent Immersion: 1,000 hours tested in accordance with ASTM D2248.

3. Colors: As selected by Architect.

D. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

PART 3 EXECUTION

3.01 INSTALLATION

A. Set railing work accurately as measured from established building lines and levels, plumb and in true alignment with previously completed work. Brace temporarily or anchor securely in formwork where work is to be built into concrete, masonry or similar construction.

B. Anchor securely in place extending posts into the ground as required.

C. Fit mechanical joints together accurately to form tight joints and uniform reveals and spaces for joint fillers and sealants. Restore any finishes that have been damaged by shipment and installation.

D. Do not cut or abrade finishes which cannot be completely restored in the field, including special finishes. Return units with special finishes that cannot be field restored to the shop for required alterations, followed by complete refinishing.

E. Remove protective coverings when there is no longer any danger of damage to the railing work from other work yet to be performed in the same location. Restore protective coverings which have been removed or damaged during shipment or installation of the work, if such other work is yet to be performed.

END OF SECTION

SECTION 05 73 13

GLAZED DECORATIVE METAL RAILINGS

PART 1 GENERAL

1.01 DESCRIPTION

A. Design and provide glazed guardrails, including posts, bases, handrails and glass infill panels as indicated on drawings for a complete railing assembly.

1.02 RELATED SECTIONS

A. Solid Surface Fabrications: Section 06 61 16.

1.03 DEFINITIONS

A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas, pedestrian guidance and support, visual separation, or wall protection.

1.04 QUALITY ASSURANCE

A. Manufacturer and Installer: Firm specializing in this type of work with experience on similar installations under like conditions.

B. Provide all materials from same manufacturer.

C. Perform all work in strict accordance with applicable local, state and federal codes.
   1. Completed railing to withstand the following loads applied to top railing:
      a. 200 pounds applied at any point in any direction.
      b. 50 pound per linear foot horizontal and vertical load.
   2. Infill of Guards
      a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
      b. Infill load & other loads need not be assumed to act concurrently

D. Railing manufacturer to verify structural adequacy and attachment details for all components supporting the railing system, including, but not limited to, steel submembers, embedment members and concrete thickness. Request all relevant shop drawings and product data from Architect.

E. 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, ambient; 180 deg F, material surfaces.

F. Safety Glazing Labeling: Permanently mark glass with certification label of the SGCC. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

1.05 SUBMITTALS

A. Product Data: Submit for all items.

B. Shop Drawings: Submit shop drawings of handrails and installation details, including manufacturer's specifications.

C. Samples: Submit the following:
1. All finished metals on 12" length of specified shape.

D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer, registered in the State of **Ohio**, responsible for their preparation.

1.06 JOB CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not suit structural performance requirements.

D. Protect work from damage during and after installation until project acceptance.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Provide delivery, storage and handling per manufacturer's recommendations. Damaged, chipped or marred goods shall not be installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, provide railing systems manufactured by one of the following:
1. LIVERS BRONZE COMPANY
2. BLUMCRAFT
3. ARCHITECTURAL METAL WORKS
4. JULIUS BLUM & COMPANY
5. R & B WAGNER INC.
6. SADEV

2.02 MATERIALS

A. Stainless Steel

1. Tubing: ASTM A 554, Grade MT 304.
2. Pipe: ASTM A 312, Grade TP 304.
3. Castings: ASTM A 743, Grade CF 8 or CF 20.
4. Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304.
5. Bars and Shapes: ASTM A 276, Type 304.

B. Aluminum
1. Extruded Bars and Shapes: ASTM B 221, Alloy 6063-T5/T52.
2. Plate and Sheet: ASTM B 209, Alloy 6061-T6.

C. Glass and Glazing
1. Laminated Glass: ASTM C 1172, Condition A (uncoated), Type I (transparent flat glass), Quality-Q3 with two plies of glass and polyvinyl butyral interlayer for interior - not less than 0.060 inch thick.
   a. Kind: LT (laminated tempered).
   b. Glass Color: Clear.
   c. Interlayer Color: Clear.
   d. Glass Thickness: ¼", each.
2. Glazing Cement and Accessories for Structural Glazing: Glazing cement, setting blocks, shims, and related accessories as recommended or supplied by railing manufacturer for installing structural glazing in metal subrails.
3. Glazing Gaskets for Glass Infill Panels: Glazing gaskets and related accessories recommended or supplied by railing manufacturer for installing glass infill panels in post-supported railings.

2.03 FASTENERS

A. Fastener Materials: Type 304 stainless-steel fasteners.

B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless otherwise indicated.

D. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

2.04 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

C. Stainless Steel: No. 4 Directional Satin.

2.05 FABRICATION

A. Fabricate railing components to achieve design intent indicated on drawings. Provide continuous top cap in maximum practical lengths; locate joints as approved by Architect.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
   1. Where welding cannot be concealed behind finished surfaces, finish joints to comply with NOMMA's "Voluntary Joint Finish Standards" Guideline #1, Joint Finish #1, no evidence of a welded joint.

C. Form work true to line and level with accurate angles and surfaces.

D. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.

E. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

F. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch or less

G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

H. Stainless steel tubing cuts shall be square, without burrs and where exposed, rounded to produce smooth rigid and hairline joints.

I. Glass Panels: Fabricate to sizes and shapes required; provide for proper edge clearance and bite on glazing panels.
   1. Clean-cut or flat-grind edges at butt-glazed sealant joints to produce square edges with slight chamfers at junctions of edges and faces
   2. Grind smooth exposed edges, including those at open joints, to produce square edges with slight chamfers at junctions of edges and faces.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify measurements shown on drawings; verify that surfaces or structure to receive materials is in condition necessary to accommodate installation.

B. Immediately report, in writing, to CM all discrepancies or errors which would result in poor application or cause latent defects in workmanship.

3.02 INSTALLATION

A. Install handrail assembly in strict accordance with manufacturer's recommendations. Fit exposed connections together to form tight, hairline joints.

B. Erection tolerances
   1. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
   2. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Protection after installation: Provide protective covering on all hand and guardrails if construction is not yet finished in the area.

D. Touch-up surfaces damaged during installation, using matching finish. Repair or replace damaged materials to Architect's satisfaction.

E. Maintenance and Cleaning
   1. Railings shall be cleaned, including infill panels, by contractor to the satisfaction of the owner.
   2. Wipe with moistened cloth only. Do not use cleaning agents with abrasive or acid/alkaline content.

F. Clean-up and remove debris, crates and equipment at completion of installation.

END OF SECTION

SECTION 06 10 50

WOOD BLOCKING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Concealed blocking for support of accessories, equipment, specialty items, cabinets, fixtures, trim, facing materials and similar type items.

1.02 REFERENCES

A. Standards

1. American Wood Protection Association (AWPA): Treatment Standards.
   a. AWPA U1 - Use Category System: User Specification for Treated Wood
2. American Society for Testing and Materials (ASTM)
   a. A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
   b. D3498 - Standard Specification for Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems
   c. D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing
   d. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
3. American Plywood Association (APA): Grades and Standards

1.03 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

B. Preservative Treated Wood: Submit certification by treating plant stating chemical and process used and conformance with applicable standards.

C. Fire Retardant Treatment: Submit certification by treating plant that fire retardant treatment materials comply with governing ordinances and that treatment will not bleed through finish surfaces.

1.04 QUALITY ASSURANCE

A. Softwood Lumber: Grading rules and wood species shall conform with the voluntary Product Standards PS 20 including grading rules of the following associations, as applicable:

1. Southern Pine: Standard Grading Rules for Southern Pine Lumber, published by Southern Pine Inspection Bureau (SPIB).
2. Douglas Fir, Western Larch and Hemlock: Western Lumber Grading Rules, published by Western Wood Products Association (WWPA), Standard Grading and Dressing Rules for West Coast Lumber Inspection Bureau (WCLIB) or National Lumber Grades Authority (NLGA).
3. Western Spruce, Pine and Fir: Western Spruce-Pine-Fir Association (WSPFA) and current Canadian Grading Rules by National Grades Association, Canada.

B. Softwood Plywood: Grading rules and wood species shall conform with Product Standard PS 1.

C. Grade Marks

1. General: Identify all lumber and plywood by official grade mark.
2. Lumber: Grade stamp to contain symbol of grading agency, mill number or name, grade of lumber, species or species grouping, or combination designation, rules under which graded, where applicable and condition of seasoning at time of manufacture.
3. Softwood Plywood: Appropriate grade trademark of the American Plywood Association.
   a. Type, grade, class and identification index.
   b. Inspection and testing agency mark.

1.05 STORAGE AND HANDLING

A. Store off the ground.

B. Protect from direct contact with the weather.

C. Provide proper ventilation.

PART 2 PRODUCTS

2.01 SOFTWOOD LUMBER

A. Species: Any commercial softwood.

B. Moisture Content: Maximum 19% at time of manufacture.

1. Fire Retardant Treated Materials: Kiln-dry all materials after treatment to maximum 15% moisture content.

C. Dimensions

1. Specified lumber dimensions are nominal unless otherwise indicated.
2. Actual dimensions conform to industry standards established by the

American Lumber Standards Committee and the rules writing agencies.

D. Surfaces: Surface four sides (S4S) unless specified otherwise.

E. Grading: Construction grade.

2.02 PLYWOOD

A. Plywood Blocking: Provide exterior grade plywood for exterior use and interior type with exterior glue for interior use. Formaldahyde free.

1. Exterior: APA-CD-EXT.
2. Interior: APA-CD-EXPOSURE I, with exterior glue.

2.03 ROUGH HARDWARE

A. General: Provide all necessary spikes, screws, nails, bolts and other hardware for satisfactory erection of work. Except where noted to be stainless steel, provide hot-dipped galvanized finish complying with ASTM A153 for hardware exposed to exterior, located in toilet rooms, in contact with treated wood or in contact with roofing or flashing.

1. Nails: ASTM F1667. Common wire nails, except where noted otherwise on drawings; sizes as noted or specified herein.
2. Attachment to Concrete or Masonry: Metal expansion type shields or inserts; sizes as required to accommodate applied fastener; spacing as indicated on drawings.
   a. "DH" or "Ankr-Tight" by WEJ-IT or equal by RED HEAD or HILTI.
   b. Sleeve type for masonry.
   c. Wedge type for concrete.
3. Adhesive Type Anchor Bolts – In Hollow CMU: Chemically grouted adhesive anchor systems with nylon or stainless steel screen inserts. Use 1/2 inch diameter anchors, unless otherwise noted.
   a. HIT HY20 Adhesive Anchors, HILTI, INC.
   b. EPCON System, ITW/RAMSET/RED HEAD
   c. Chem-Stud Adhesive Anchors, RAWLPLUG COMPANY, INC.
   d. Simpson Set Epoxy- Tie Adhesive Anchors, SIMPSON STRONG-TIE COMPANY, INC.
4. Adhesive Type Anchor Bolts - In solid grouted CMU and Concrete: Chemically grouted adhesive anchor systems. Use ¾ inch diameter anchors, unless otherwise noted.
   a. HIT HY200A Adhesive Anchors, HILTI, INC.
   b. EPCON System, ITW/RAMSET/REDHEAD
   c. Chem-Stud Adhesive Anchors, POWERS FASTENERS, INC.
   d. Simpson Set Epoxy-Tie Adhesive Anchors, SIMPSON STRONG-TIE COMPANY, INC.
5. Attachment to Steel Studs: Self tapping screws of sufficient length and strength to perform the functions for which they are used.
6. Roof Construction

a. Wood-to-Wood Attachment: 300 Series stainless steel, flat head.
   1) Plywood to Nailers: Minimum #8 x 1-3/4".
b. Wood-to-Metal Deck Attachment: Hot dip galvanized in accordance with ASTM A153; machine bolts, locknuts and washers; minimum 3/8" diameter.
c. Wood-to-Concrete Attachment: 300 Series stainless steel expansion anchors as specified above. Minimum 3/8" diameter, length as required for minimum 2" concrete embedment.

2.04 ADHESIVE

A. Adhesives: Low VOC type. Water- and mold-resistant formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

PART 3 EXECUTION

3.01 CONDITIONS OF SURFACES

A. General: Verify that surfaces to receive blocking are prepared to exact grades and dimensions.

3.02 INSTALLATION

A. Align and anchor blocking with countersunk bolts, washers, nuts, or nails, as applicable.

B. Locate blocking to facilitate installation of finishing materials, fixtures, specialty items and trim.

3.03 CLEAN UP

A. Clean up debris and cuttings on a regular daily basis. Remove and dispose of excess materials and debris created by wood blocking.

B. Maintain the building and site free of accumulations of cutting and waste materials in a neat orderly condition acceptable to the Architect.

END OF SECTION

SECTION 06 40 00

ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide architectural woodwork as indicated and specified. Work includes:

1. Custom Casework. Include the following:
   a. Custom type plastic laminate clad reception desk casework and countertop components as detailed on the drawings.
2. Plastic laminate countertops.
3. Solid surface and quartz composition countertops and fabrications.
4. Wood shelf and coat rod.

1.02 RELATED SECTIONS

A. Wood Blocking: Section 06 10 50

B. Manufactured Plastic Laminate Clad Casework: Section 12 33 55.

1.03 REFERENCES

A. Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard:

1. ANSI: American National Standards Institute.
2. AWI: Architectural Woodwork Institute.
3. NEMA: National Electrical Manufacturer's Association.
4. P.S.: U.S. Product Standard.

1.04 SUBMITTALS

A. Product Data: Submit for all items.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Provide large scale details.
2. Indicate methods of fabrication, edging, location and construction of joints.
3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections

C. AWI Quality Standards: A photo-copy of the applicable portions of the AWI

publication "Architectural Woodwork Quality Standards", latest edition, shall be submitted with each set of shop drawings.

1. Each copy must be marked to clearly show all details, specifications and finishes proposed for this work.

D. Submit samples of all finish materials, including the following:

1. Plastic laminate for texture and color selections. (8” x 10”).
2. Solid or quartz surface material.

E. Manufacturer's product data describing type and quality of the following:

1. Plastic laminate (face grade and liner grade).

F. Submit certification that fire-retardant treatment materials comply with governing ordinances and meet or exceed ASTM E84 tests. Include certification by treating plant that treatment will not bleed through finish surfaces. Materials shall bear UL label showing Flame Spread 25 or less and smoke developed 40 or less. Mill certification is not acceptable.

1.05 QUALITY ASSURANCE

A. Fabricator qualifications: A firm specializing in the fabrication of millwork with a minimum of 5 years experience and a satisfactory record of performance on projects of comparable size and quality. Shop is in compliance with all AWI's Quality Certification Program requirements.

B. Installation: Performed only by skilled finish carpenters with a minimum of 3 years experience in installing custom millwork similar to that required for this project.

C. All solid surface material type work shall be performed by a Manufacturer Certified fabricator.

D. Provide lumber factory marked with type, grade, mill and grading agency identification on concealed surfaces. Omit marking and submit mill certificates for materials to receive transparent finishes that cannot be marked on a concealed surface.

E. Quality Grade: Materials and fabrication shall be "custom grade" unless otherwise indicated on the drawings or specified herein as "premium grade", both in accordance with "Quality Standard Illustrated," of the AWI conforming to the following sections:

1. Section 100: Solid wood members.
2. Section 200: Plywood and particleboard.
3. Section 400: Casework and tops.
4. Section 1700: Installation of architectural woodwork.

1.06 DELIVERY, STORAGE AND HANDLING

A. Protect woodwork materials and items during delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver woodwork materials and items until concrete, masonry, painting, grinding and other similar wet work has been completed and is thoroughly dry, outside door openings are permanently watertight, exterior windows are glazed and, in case of temperature dropping below 60° F., until temporary heating and ventilating systems are in operation.

C. Store materials in dry, well-ventilated spaces with constant minimum temperature of 60° F., and maximum relative humidity of 55%.

1. Do not store adhesives with materials that have a high capacity to absorb VOC emissions (i.e., materials which are woven, fibrous or porous in nature, such as acoustical ceilings, carpets, textiles, etc.).
2. Do not store adhesives in occupied spaces.

1.07 PROJECT CONDITIONS

A. Provide and maintain a constant temperature and humidity before, during and after installation as required to maintain optimum moisture content of installed materials.

B. Field Measurements: Where cabinets are 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 cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.09 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

PART 2 PRODUCTS

2.01 MATERIALS

A. Lumber

1. Provide lumber surfaced four sides (S4S) and worked to profiles and patterns shown. Nominal sizes are as shown, except where detailed dimensions are indicated.
2. Moisture Content: Provide materials kiln-dried to maximum moisture content of 6% complying with AWI Standards, Section 100-G-3.
3. Softwood Lumber: Comply with PS-20, "American Softwood Lumber Standard," and with applicable rules of grading and inspection agency for species indicated.
    a. Western Red Cedar, Ponderosa Pine, White Pine: Western Lumber Grading Rules, published by Western Wood Products Association (WWPA), or Standard Grading Rules for West Coast Lumber, No. 16, published by West Coast Lumber Inspection Bureau (WCLIB).
4. Species: Fabricator's option.

B. Softwood Plywood: Thickness as indicated. Formaldehyde free.

1. Concealed Use: APA-BB-EXPOSURE I, with exterior glue (Plyform).
2. Comply with PS-1, "Construction and Industrial Plywood".

C. Particle Board (Substrate for Laminate Surfaces): High density industrial grade with a minimum density of 45 pounds per cubic foot and a moisture content between 12% maximum and 8% minimum, meeting or exceeding ANSI A208.1 grade M-2 minimum or ASTM D1037; formaldehyde-free. ASTM E84, Class A.

1. ARAUCO Vesta FR Particleboard
2. SIERRAPINE Encore FR
3. PANEL SOURCE INTERNATIONAL Pyroblock Platinum Particleboard

D. Plastic Laminate: Conform to the requirements of the National Electrical Manufacturer's Association (NEMA) Publication Number LD-3. Colors, patterns and finishes as indicated.

1. General Purpose Grade: 0.05 inches thick.
2. Backing Sheet Grade: 0.02 inches thick.
3. Post-Forming Grade: 0.042 inches thick.
4. Cabinet Liner: 0.02 inches thick.
5. Provide solid color type where indicated on drawings.
6. Fill and seal plastic laminate joints with Seamfil by KAMPEL ENTERPRISES, INC. or equal. Colors to match plastic laminate.
7. Manufacturer and Color: As indicated
8. Other Acceptable Manufacturers: Solid surface manufactured by the following companies are acceptable providing they meet the requirements specified herein and the colors and pattern are an acceptable match as determined by the Architect.
    a. FORMICA
    b. PIONITE
    c. NEVAMAR
    d. WILSONART.

e. LAMINART

E. Adhesive: Low-VOC, FS MMM-A-125C, Type II, water- and mold-resistant; complying with required VOC regulations.

F. Quartz Composition Material: Non porous, scratch and high temperature resistant crushed quartz composition.

1. Thicknesses: As indicated.
2. Flexural properties: ASTM D 790, ASTM C 880
3. Compression strength: ASTM C 170
4. Certified food contact: NSF/ANSI 51 Certified.
5. Surface burning characteristics - ASTM E 84: Class I or A, and as follows:
   a. Flame spread: <25.
   b. Smoke developed: <25.
6. Joints: Provide watertight color matched, fused joints as recommended by manufacturer.
7. Edge Treatment: As detailed on drawings. Ease all exposed edges not otherwise detailed.
8. Manufacturer and Color: As indicated
9. Other Acceptable Manufacturers: Solid surface manufactured by the following companies are acceptable providing they meet the requirements specified herein and the patterns and colors are an acceptable match as determined by the Architect.
   a. DU PONT Corian
   b. CAMBRIA
   c. CAESERSTONE
   D. LG VIATERA

G. Solid Surface Material: 1/2” or 3/4" inch thick sheets.

1. Provide thicknesses as indicated on the drawings.
2. Surface burning characteristics in accordance with ASTM E 84: Class I or A, and as follows:
   a. Flame spread: <25.
   b. Smoke developed: <25.
3. Joints: Provide watertight, fused joints as recommended by manufacturer.
4. Edge Treatment: As detailed on drawings. Ease all exposed edges not otherwise detailed.
5. Make field cut-outs as required to install plumbing items and toilet accessories. See Division 22 and Section 10 28 13.
6. Manufacturer and Color: As indicated
7. Other Acceptable Manufacturers: Solid surface manufactured by the following companies are acceptable providing they meet the requirements specified herein and the patterns and colors are an acceptable match as determined by the Architect.
   a. DU PONT Corian
   b. FORMICA
   c. WILSONART

2.02 FABRICATION

A. General: Except as specified hereinafter, fabricate all work in accordance with AWI quality standards as specified. Work not specified with a level of quality shall be not less than "Custom" quality per AWI. All particle board panels to be balanced construction.

B. Plastic Laminate Countertops

1. Quality Standard: Custom Grade per AWI Section 400.
2. Top Core: Construct tops of 3/4" thick particle board core typical; provide exterior grade plywood (Plyform) at counters with sinks (and associated splashes) and other locations where indicated on drawings.
   a. Where double layers indicated, glue together to form monolithic 1-1/2" thick panel.
3. Splashes: Provide with minimum 1/4" scribe typical.
   a. Integral coved back splash with permanently attached straight side splash coped into backsplash
   b. Seal: Prior to permanent attachment of straight splashes to top, seal all joints by setting in continuous bead of clear silicone sealant.
4. Exposed Edges: Build exposed edges to 1-1/2" thick at overhang by attaching continuous strip of core material to bottom side of top.
5. Joints in core, if required, to be fitted with mechanical panel fasteners; spacing not to exceed 12" apart nor more than 3" from outside corners.
6. Finishes: Finish tops, splashes and edges with plastic laminate as follows:
   a. General purpose grade
   b. Balance underside of tops with backing sheets, 0.020".
   c. Finish bottom of all overhangs with laminate.
7. Custom Edges: Finish as indicated on drawings.
8. Edges: Except where cabinet design requires matching laminate edge, provide 3mm PVC on Front & Back Edges, 1mm PVC on Side Edges.
9. Provide counter supports at 36” maximum.

D. Solid Surface and Quartz Surface Material Countertops and Components: Fabricate to profiles, sizes and edge conditions indicated on drawings and as directed by manufacturers requirements.

1. Solid Surface: Back and side splashes, where indicated, to be fused to top to ensure watertight joint.
2. Fabricate with openings and mortises precut, where possible to receive fixtures, accessories and other similar items of work.
3. Ease edges as indicated on the drawings.
4. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and solid surface manufacturer requirements.
5. Where countertops do not have a continuous substrate, locate and provide closure strips to prevent openings from countertop underside to top of support casework.

6. Where joint design intent indicated is to be seamless, provide manufacturers recommended adhesive to create inconspicuous, nonporous joints, with chemical bond.
7. Provide counter supports at 42” maximum or as recommended by manufacturer.

PART 3 EXECUTION

3.01 PREPARATION

A. Condition architectural woodwork materials, items and products to average prevailing humidity conditions in installation areas before installing.

B. Install blocking and anchoring devices built into substrates for anchorage of architectural woodwork.

C. Deliver inserts and anchoring devices to be built into substrates well in advance of time substrates are to be built.

D. Before installing woodwork, examine shop-fabricated work for completion and back priming.

E. Ventilation for Adhesives: Comply, at a minimum, with the adhesive manufacturers’ recommendations for space ventilation during and after installation. Maintain the following ventilation conditions during the adhesive curing period or for 72 hours after installation (whichever is longer): 1) supply 100% outside air 24 hours a day; 2) supply airflow at a rate of 6 air changes per hour, when outside air temperatures are between 55^{o} F and 85^{o} F and humidity is between 30% and 60%; and 3) supply airflow at a rate of 1.5 air changes per hour, when outside air conditions are not within the range stipulated in the previous item 2.

3.02 INSTALLATION

A. Quality: Comply with AWI Section 1700.

B. Install woodwork materials and products plumb, level, true and straight with no distortion. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level (including countertops, window stools and shelves), and with 1/16" maximum offset in flush adjoining surfaces, 1/8" maximum offsets in revealed adjoining surfaces.

C. Scribe and cut work to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

D. Install countertops level, true to alignment, accurately fit to wall conditions and securely fastened to base units and other support systems as indicated.

1. Solid Surface Type Countertops: Form joints using tinted adhesive as

recommended by top manufacturer.

E. Casework: Install without distortion so that doors and drawers will fit openings properly and be accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.

F. Anchor woodwork to anchors or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk concealed fasteners and blind nailing as required for a complete installation. Use fine finishing nail for exposed nailings, countersunk and filled flush with woodwork.

3.03 CLEANING AND PROTECTION

A. Repair damaged and defective millwork to eliminate functional and visual defects. Where not possible to repair properly, replace millwork as directed by the Architect.

1. Chipped, scratched or patched plastic laminate will not be accepted and must be replaced.

B. Clean hardware, lubricate and make final adjustments for proper operation.

C. Protect installed work during remaining construction operations.

D. Clean woodwork on exposed and semi-exposed surfaces. Touch-up shop applied finishes to restore damaged or soiled areas.

E. Cover completed casework with 4-mil polyethylene film protective enclosure, applied in a manner that will allow easy removal and without damage to woodwork or adjoining work. Remove cover immediately before the time of final acceptance.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 GENERAL

1.01 SCOPE

A. General: Prepare joints and apply sealant or caulking at all locations which normally require sealing to prevent infiltration of air, water, and insects and to reduce transmission of sound.

B. Apply sealants to exterior and interior non-static joints. Do not seal normal drainage points or weep holes. Include the following:

1. masonry control and expansion joints
2. around louvers, exterior trim, windows, door frames, aluminum entrances and other penetrations or openings in exterior walls
3. threshold bedding
4. joints between different wall materials
5. termination in joints between wall materials and adjacent materials
6. perimeter seal of metal door and borrowed light frames where they abut masonry and where they abut drywall in toilet rooms
7. other applications indicated

C. Sealing of joints in concrete construction, including sidewalk joints, concrete paving joints and floor joints, tile floor expansion joints and other floor joints as indicated.

D. Sealing of all exterior and interior locations where materials or equipment do not fit together or against the adjoining surface with a hairline joint.

F. Sealing between wall and wall mounted plumbing fixtures and floor and floor mounted plumbing fixtures.

G. Sealing at intersection of countertops and side/backsplashes to each other and to wall.

H. Seal penetrations through ceramic tile work.

I. Latex type caulking of interior static joints. Include the following:

1. perimeter seal of metal door and borrowed light frames where they abut drywall , except in toilet rooms
2. intersection of cabinets, casework and similar items applied to or recessed in walls
3. other applications indicated

J. Joints, perimeter, and penetrations in sound-rated assemblies. See Section 09 21 16.

1.02 RELATED SECTIONS

A. Gypsum Board Systems: Section 09 21 16.

1.03 GENERAL PERFORMANCE

A. Except as otherwise indicated, joint sealant is required to establish and maintain airtight and waterproof continuous seals on a permanent basis, within recognized limitations of wear and aging as indicated for each application.

B. Failures of installed sealant to comply with this requirement will be recognized as failures of both materials and workmanship.

1.04 SUBMITTALS

A. Submit manufacturer's product data and installation instructions.

1. Certification, in the form of manufacturer's standard data sheet or by letter, stating that each type of compound and sealant to be furnished complies with these specifications.
2. Statement that each product to be furnished is recommended for the application shown and is compatible with all materials to which applied.
3. Instructions for handling, storage, mixing, priming, installation, curing and protection for each type of sealant.

B. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

B. Submit manufacturer's color chart for color selections.

B. Submit cured sealant samples in colors required for the work. Architect's approval will be for color only. Compliance with other requirements is the Contractor's responsibility.

1.05 STORAGE AND HANDLING

A. Prevent inclusion of foreign matter or the damage of materials by water or breakage.

B. Procure and store in original containers until ready for use.

C. Materials showing evidence of damage shall be rejected.

1.06 WARRANTY

A. Installer’s Warranty: Contractor and joint sealant applicator shall jointly warranty joint sealant work for two (2) years from date of final acceptance. Warranty shall include replacing joints which fail to perform as airtight; or fail in adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration and stain resistance, general durability or any other form of apparent deterioration (excluding inherent qualities and limitations clearly specified in the manufacturer's submitted product data).

B. Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section for ten (10) years from date of final acceptance

C. Warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.

C. Comply with these specifications for repair or replacement of work.

PART 2 PRODUCTS

2.01 GENERAL

A. Definitions:

1. The term "sealant" will be understood to be a urethane or silicone elastomeric type.
2. The term "caulk" will be understood to be a synthetic resin base of highest quality acrylic latex compound.

B. General:

1. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
2. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

3. Colors: As selected by Architect from manufacturer's full range; selected colors to match adjacent materials.
4. Where exposed to foot traffic, select materials of sufficient strength and hardness to withstand stiletto heel traffic without damage or deterioration of sealant system.

C. Manufacturers: BOSTIK; DOW CORNING CORPORATION; EUCLID CHEMICAL; TREMCO MANUFACTURING COMPANY; GENERAL ELECTRIC COMPANY/MOMENTIVE; SIKA CHEMICAL CO.; MAMECO INTERNATIONAL; MASTER BUILDERS SOLUTIONS; VULCHEM: SOPREMA CHEMLINK.

1. Manufacturer's listed under the following applications are for basis of design. Equal products by above listed manufacturers are acceptable.

2.02 ELASTOMERIC MATERIALS

A. Exterior Vertical and Overhead Joints: Single-component neutral curing silicone sealant meeting ASTM C920, Type S, Grade NS, Class 50.

1. DOW 791
2. GE SCS9000 Silpruf NB
3. TREMCO Spectrum 3
4. PECORA 895 NST

B. Horizontal Wearing Expansion Joints; Interior and Exterior

1. Type: Two-part polyurethane based elastomeric sealant, complying with ASTM C920, Class 25, Type M, Grade P, Use T. Self-leveling or gun grade type as recommended by manufacturer for application shown.
2. Location: For joints in exterior concrete pavements, sidewalks and interior floors.
   a. BOSTIK Chem-Calk 555-SL
   b. EUCLID Eucolastic II
   c. SONNEBORN Sonolastic SL 2
   d. TREMCO THC 900/901

C. Interior Vertical and Overhead Joints: Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT. Do not use where painted.

1. DOW 799
2. GE SCS2000 SilPruf
3. TREMCO Spectrum 2
4. PECORA 895 NST

D. Interior Vertical and Overhead Joints: Use at joints requiring movement and to be painted. Single or multi-component polyurethane hybrid gun-grade, non-sag sealant complying with ASTM C920, Type S or M, Class 25, Use NT, M, A, Grade NS.

1. EUCLID Eucolastic I or II
2. BASF Sonolastic NP 1 or NP 2
3. BOSTIK Chem-Calk 900
4. TREMCO Dymonic

E. Sealants at Countertops, Backsplashes and Plumbing Fixtures: ASTM C920, Type S, Grade NS, Class 25. Provide with mildew resistive additive.

1. Sealant Colors
   a. Countertops and Backsplashes: Clear.
   b. Plumbing Fixtures: white, unless colored fixtures are selected, then sealant color shall match fixture color.
2. Manufacturers/Products
   a. DOW 786
   b. GE SCS1700 Sanitary.
   c. SONNEBORN Sonolastic Omniplus
   d. TREMCO Tremsil 200
   e. PECORA 898 Sanitary Sealant

2.03 LATEX CAULK

A. Caulk Joints – Interior, Static - Paintable: High quality acrylic latex compound, non-staining non-bleeding complying with ASTM C834 Type OP, Grade NF with a maximum volume shrinkage of 30%.

1. BASF BUILDING SYSTEMS; Sonolac.
2. PECORA CORPORATION; AC-20+.
3. TREMCO INCORPORATED; Tremflex 83

2.04 ACCESSORIES

A. Joint Primer/Sealer: Non-staining type, recommended by sealant manufacturer; compatible with joint forming material.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming material.

C. Bond Breaker Tape: Pressure sensitive polyethylene or plastic tape, recommended by sealant manufacturer, to suit applications where bond to substrate should be avoided for proper joint sealant performance.

D. Joint Backing: Compressible rod stock conforming to ASTM C1330, Type B; material as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance

E. Solvents: Cleaning agent recommended by the manufacturer of the sealant in writing to Architect.

PART 3 EXECUTION

3.01 INSPECTION

A. Pre-Installation Meeting

1. Prior to sealant installation, and at the Contractor's direction, meet at project site to review material selections, joint preparations, installation procedures, weather conditions and coordination with other trades.
2. Include sealant installer, Contractor, Architect, manufacturer's representative and representatives of other trades or subcontractors affected by the sealant installation.

B. Examine substrates and installation conditions. Do not proceed with joint sealant work until unsatisfactory conditions have been corrected.

C. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Clean, seal and prime surfaces in accordance with manufacturer's recommendations. Confine primer/sealant to areas of sealant bond.

B. Remove dust, dirt, loose coatings, moisture and other substances which could interfere with sealant bond.

C. Remove lacquers and protective films from metal surfaces.

D. Architectural Concrete and Stone: Apply masking around joints to protect adjacent surfaces from defacement and staining during sealing operations. Repair damaged masking until sealant is installed.

3.03 INSTALLATION

A. Apply joint sealant as late as possible in construction, preceding painting and following cleaning operations. Do not apply sealant during inclement weather conditions or when temperature is above or below manufacturer's limitations for installation.

B. Install joint sealant materials and accessories in strict accordance with manufacturer's installation instructions.

C. Set joint filler units at depth or position in joint as indicated to coordinate with other work. Do not leave voids or gaps between ends of joint filler units.

D. Install sealant backer rod, except where recommended to be omitted by sealant manufacturer for application indicated. Use rod diameter that will cause

compression when installed.

E. Install bond breaker tape and where required by manufacturer's recommendations to ensure that sealants will perform as intended.

F. Apply joint sealants in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces on both sides. Fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. At horizontal joints between a horizontal surface and vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt. Hand tool and finish all joints.

G. Install joint sealants within recommended temperature ranges and to depths indicated or when not indicated, as recommended by sealant manufacturer. For normal moving vertical and horizontal joints, fill joints to a depth equal to 50% of joint width, but not more than 1/2" deep nor less than 1/4" deep, measured at the center section of bead.

H. Confine materials to joint areas with masking tapes or other acceptable methods. Remove excess sealant materials promptly as work progresses and clean adjoining surfaces.

3.04 CLEANING

A. Upon completion, remove and dispose of masking materials; remove all excess sealing materials; clean adjacent materials of all soil and stain resulting from sealing operations.

1. Replace damaged material and material which cannot be properly cleaned.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL FRAMES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:

1. Standard steel frames.

1.02 RELATED SECTIONS

A. Wood Doors: Section 08 14 00.

B. Door Hardware: Section 08 71 10.

1.03 QUALITY ASSURANCE

A. Provide metal frames fabricated by one manufacturer to ensure uniformity in appearance and construction.

B. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard.

1. ANSI: American National Standards Institute.
2. ASTM: American Society for Testing and Materials.
3. SDI: Steel Door Institute.
4. DHI: Door and Hardware Institute.

C. Sound transmission class: Provide certificate that door assemblies have been tested in accordance with ASTM E413 and ASTM E1408 to achieve minimum sound transmission class (STC) specified.

1.04 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of standard metal door and frame required.

B. Submit shop drawings. Identify doors and frames in accordance with drawing door schedule. Indicate:

1. Elevations of each door design.
2. Hardware locations, installation methods and hardware reinforcements.
3. Dimensions and shapes of materials, anchorage and fastening methods.
4. Door frame types, profile of molding and details.

5. Wall opening construction and connection to other work.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver metal frames cartonned or crated for protection during transit and job delivery. Provide sealed wrapping for factory.

B. Store frames inside the building in a dry, well-ventilated area. Protect from damage, wetting and deterioration in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer: STEELCRAFT MFG. CO; CECO CORP.; PIONEER INDUSTRIES; REPUBLIC BUILDERS PRODUCTS CORP.; CURRIES; METAL PRODUCTS INC (MPI).

2.02 MATERIALS AND COMPONENTS

A. Materials

1. Metallic-Coated Steel: Commercial quality, hot dipped, A-60 galvannealed steel in accordance with ASTM A653, “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process”.
2. Cold-Rolled Steel: Commercial Steel in accordance with ASTM A1008, “Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low-Alloy and High Strength with Improved Formability”; Type B; suitable for exposed applications.
3. Hot-Rolled Steel Sheet: Commercial Steel in accordance with ASTM A1011, “Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High Strength Low-Alloy with Improved Formability, and Ultra-High Strength”; Type B; free of scale, pitting, or surface defects; pickled and oiled.

B Comply with SDI 100 material and fabrication recommendations and as specified.

C. Standard Metal Frames

1. Interior Frames: Fabricated from either commercial grade cold-rolled steel conforming to ASTM A1008 or commercial grade hot-rolled and pickled steel conforming to ASTM A1011, minimum 0.053” thick. Set-up and welded type, all miters clean cut, reinforced, fully seam welded with exposed welds ground smooth.
2. Profile: Double rabbet, jamb face and depth as indicated.
3. Hardware Reinforcements: Meet SDI 107 requirements.

2.03 FABRICATION

A. Provide surfaces smooth and free from defects, warp or buckle with arrises straight and sharp.

B. Reinforce frames to receive surface applied hardware. Drilling and tapping for surface applied finish hardware may be done at project site.

C. Locate finish hardware as shown on drawings or, if not shown, in accordance with DHI "Recommended Locations for Builder's Hardware."

D. Frame Fabrication

1. Provide cutouts for mortised hardware, accurately located and made to fit hardware.
2. Punch frames for door silencers, three on strike side for single doors. Factory install plastic caps. Stick-on silencers are not acceptable.
3. Interior Frames: Provide minimum three anchors of suitable design for each jamb. Provide galvanized anchors for units built into exterior walls.
4. Floor Anchors: Provide floor clip on bottom of each jamb. Provide angle spreaders at bottom of each set-up frame.
5. Conduit for Door Frames
   a. Shop install ¾" electrical conduit within hollow metal door frame where indicated or where required for electric strikes or similar type electrical frame mounted hardware.
   b. Route conduit in frame in the most direct and simple manner so that pulling wire can be performed with a minimum of bends and obstructions. Route conduit to avoid damage to conduit during field installation of frame and operations to grout frame solid.
   c. Connect conduit to electrical junction box or conduit embedded in building structure by means of a threaded coupling. The termination point of the conduit within the frame shall be free and have enough slack to make final connection to embedded device.

E. Shop Painting

1. Clean, bonderize or chemically treat and paint exposed surfaces of steel door and frame units, including galvanized surfaces.
2. Clean steel surfaces of mill scale, rust oil, grease, dirt and other foreign materials before application of paint. Sand free of imperfections.
3. Apply one baked-on shop coat of rust-inhibitive prime paint in accordance with ASNI A224.1. Provide a smooth, uniformly finished surface ready to receive finish paint.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates, rough openings and installation conditions. Do not proceed

with metal frame work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

A. Install metal frames in accordance with manufacturer's instructions and recommendations.

B. Placing Frames

1. General
   a. Comply with ANSI/SDI A250.11 (SDI 105) "Recommended Erection Instructions for Steel Frames."
   b. Erect frames in proper position to receive partition work before construction of enclosing walls. Set frames accurately in position, plumbed, aligned with heads level and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders.
2. At Masonry Construction: Locate wall anchors at 16" on center. Building-in of anchors and grouting of frames is specified in Section 04 00 00.
3. Metal Stud Partitions: Install at least 3 wall anchors per jamb at hinge and strike levels. Attach wall anchors to studs with tapping screws.

C. Immediately after erection, sand smooth rusted or damaged areas of frame coat and apply touch-up prime coat of compatible air-drying primer.

3.03 FIELD QUALITY CONTROL

A. Final Adjustment: Provide final adjustment as follows:

1. Door Contact with Silencers: Doors shall strike a minimum of two (2) silencers without binding lock or latch bolts in strike plate.
2. Head, Strike and Hinge Jamb Clearance: 1/8”.
3. Meeting Edge Clearance, Pairs of Doors: +1/16”
4. Bolts and Screws: Leave tight and firmly seated.

END OF SECTION

SECTION 08 14 00

WOOD DOORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide the following types of wood doors:

1. Solid core

1.02 RELATED SECTIONS

A. Hollow Metal Frames: Section 08 11 13

B. Door Hardware Section 08 71 10.

C. Glass and Glazing: Section 08 81 00.

1.03 QUALITY ASSURANCE

A. Provide wood doors fabricated by one manufacturer to ensure uniformity in appearance and construction.

B. Reference Standards

1. Underwriters' Laboratories - UL 10C (positive pressure) - Fire Tests of Door Assemblies
2. Window and Door Manufacturers Association (WDMA): WDMA IS 1A-04.
3. Architectural Wood Work Institute: AWI "Quality Standards, Guide Specification" requirements.
4. NFPA 80 - Fire Doors and Windows
5. NFPA 252 - Standard Methods of Fire Tests for Door Assemblies

1.04 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of wood door required.

1. Include details of core and edge construction.
2. Include certification indicating compliance with specification requirements.

B. Submit Shop Drawings

1. Indicate location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking and other

pertinent data.

2. Identify doors in accordance with drawing door schedule.

C. Submit sample corner section, 12" square, showing required veneer and edge construction.

D. Finish Samples

1. Factory Finished Doors: Submit three (3) flitch samples of each species of face veneer with factory applied stain and finish as specified and indicated illustrating expected range of color and grain variation.

1.06 DELIVERY, STORAGE AND HANDLING

A. Store and protect doors in accordance with manufacturer's recommendations and WDMA.

B. Following are general guidelines. For more specific information refer to WDMA's Appendix Section “Care and Installation at Job Site.”

1. Deliver doors in manufacturer's original unopened protective packaging or wrapper.
   a. Store doors flat and off the floor on a level surface in a dry, well-ventilated building. Do not store on edge. Protect doors from dirt, water and abuse.
   b. Do not subject interior doors to extremes in either heat or humidity. HVAC systems should be operational and balanced, providing a temperature range of 50 to 90 degrees Fahrenheit and 30% to 50% relative humidity.
   c. When handling doors, always lift and carry. Do not drag across other doors or surfaces. Handle with clean hands or gloves.
   d. Each door will be marked on top rail with opening number.

1.07 WARRANTY

A. Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
   b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
2. Warranty Period for Solid-Core Exterior Doors: Two years from date of Substantial Completion.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. Interior Flush Doors Solid Core: Meet or exceed WDMA I.S.1A Industry Standard for Wood Flush Doors requirements and as specified. WDMA I.S.1A. Performance Grade –Heavy Duty.

1. Interior Flush Doors Solid Core – Non-Rated Doors: Provide one of the following cores with hardwood veneers:
   a. Particleboard-Core: ANSI A208.1, Grade LD-1 or Grade LD-2.
   b. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware
      1) 5-inch top-rail blocking, in doors indicated to have closers.
      2) 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
   c. Provide doors with glued-wood-stave or structural-composite-lumber] cores instead of particleboard cores for doors indicated to receive exit devices.
   b. Structural Composite Lumber Core (SCLC-5) is an engineered hardwood composite sometimes referred to as LSL (Laminated Strand Lumber). The material complies with WDMA minimum performance levels for interior applications with screw holding power of 540 lbs., modulus of rupture of 6,500 psi, and density of 38 lbs per cubic foot. Formaldehyde free.

B. Moldings: Trim louver and glass openings with recessed bead type wood moldings, species matching door face veneer species. Profiles as selected by the Architect from manufacturer's standard profiles.

1. Glass Lites in Fire Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire rating indicated. Include concealed metal glazing clips where required for opening size and fire rating indicated.

2.02 FABRICATION

A. Flush Doors: Fabricate doors in accordance with WDMA I.S. 1A, Custom with Grade A faces Grade requirements for transparent stained finish. Formaldehyde free.

1. Core Construction: Bond stiles and rails to core and sand entire unit prior to assembly of face veneers.
2. Number of Plies: 5.
3. Face Veneers: Minimum 1/50" thick before sanding, plain sliced select hardwood, species and color to match existing.
   a. Veneer Figure: Biological defects of grain, color and effects including but not limited to - blisters, flake, quilts, rope, burl, crotch, mottle patterns, shall not exceed approved veneer samples.
4. Door Thickness: 1-3/4" thick.

5. Adhesive: Type I, waterproof.
6. Edge Strips: Stile edges hardwood species matching face veneer; bonded to core; 1-1/8" minimum width after trimming. Top and bottom edges hardwood of mill option.
7. Match Between Veneer Leaves:
   a. Plain Sliced Veneer: Book matched for color and grain.
   b. Rift or Quarter Sawn Veneer: Slip match for color and grain.
8. Assembly of Veneer Leaves on Door Faces: Running match.
9. Hardware: Factory machine for mortise hardware using template provided by hardware manufacturer.
10. Reinforcement: Reinforce doors to receive hardware specified.
    a. Hinge Attachment: Stiles and rails to be continuously glue bonded to the core so that screw stress is transmitted directly to the core.
    b. Closure, Exit Device and Other Surface Mounted Hardware: Provide top rail 2-1/2" or more in width to hold closer fasteners and solid wood blocking for all other surface applied hardware.

C. Factory Finish

1. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
   a. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
2. Finish: WDMA TR-4 conversion varnish.
3. Staining: Color to match existing and approved by Architect.
4. Effect: Filled finish.
5. Sheen: Satin.

D. Individually package doors at factory with manufacturer's standard packaging or wrapping for delivery to job site.

E. Manufacturers: MASONITE; EGGERS - VT INDUSTRIES, OSHKOSH; LAMBTON DOORS.

1. Stile and Rail Doors: Above listed manufacturers.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substances, rough openings and installation conditions. Do not proceed with wood door installation until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Verify metal frame dimensions and hardware mortises in metal frames with metal frame manufacturer.

3.03 INSTALLATION

A. Condition doors to average prevailing humidity in installation area before hanging.

B. Install doors in accordance with manufacturer's installation instructions. Job fit and prepare doors to receive hardware. Bevel 1/8" in 2" at strike edges for clearance in arc of swing. Seal cut surfaces, tops, bottoms and edges with sanding sealer after fitting and machining.

C. Hang doors straight, plumb and square securely anchored into position. Adjust doors to provide uniform clearance and to contact stops uniformly. Remove and replace doors that are warped, bowed or otherwise damaged and cannot be properly fit to the opening.

3.04 PROTECTION

A. Protect installed doors from soiling, staining and damage until final acceptance.

B. Repair or replace doors damaged beyond acceptable repair as directed by the Architect.

END OF SECTION

SECTION 08 31 13

ACCESS DOORS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide wall, partition and ceiling access doors for access to mechanical and electrical equipment as indicated.

1.02 RELATED SECTIONS

A. Finish Painting: Section 09 91 00.

1.03 QUALITY ASSURANCE

A. Coordination: Furnish inserts and anchoring devices that must be built into other work for installation of access panels. Coordinate delivery with other work to avoid delay.

1.04 SUBMITTALS

A. Submit product data and shop drawings for each item. Include installation instructions for conditions involved.

PART 2 PRODUCTS

2.01 MATERIALS AND FABRICATION - WALL AND CEILING TYPES

A. General: Provide access panel assembly manufactured as an integral unit, complete with all parts and ready for installation. Fabricate units of continuous welded steel construction, unless otherwise indicated. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of support shown.

B. Standard Access Door

1. Description: Minimum 14 gage steel panels with minimum 16 gage steel frames. Units to have concealed hinges.
2. Provide with exposed 1” frame flange.
3. Manufacturer: Provide panels by one of the following, subject to the above requirements.
   a. J. L. INDUSTRIES INC. Model TM
   b. LARSEN’S MANUFACTURING Model L-MPG
   c. BABCOCK-DAVIS Model B-NT
   d. NYSTRON Model NT/NW/NP

C. Locks

1. Exposed to Public: Provide cylinder locks on all access doors; 7-pin removable core cylinders. Key in accordance with Section 08 71 10.
2. All Others: Screw drive type latching device.

D. Factory Prime Finish: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine areas and conditions under which access panels are to be installed.

B. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 INSTALLATION

A. Comply with manufacturer's instructions for installation of access panels.

B. Coordinate installation with work of other trades.

C. Set frames accurately in position and securely anchor to supports with face panels level in relation to adjacent finish surfaces.

3.03 ADJUST AND CLEAN

A. Adjust hardware and panels after installation for proper operation.

B. Remove and replace panels or frames that are warped, bowed or otherwise damaged.

END OF SECTION

SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work under this section includes the design of the aluminum entrance and window systems and all materials, labor and equipment for the complete installation of the work as shown on the drawings and specified herein. Work includes:

1. Aluminum entrance doors.
2. Aluminum entrance framing system for entrances and vestibule, including sidelight and transom frames as indicated.
3. Aluminum storefront system.
4. Glass and glazing of the systems.
5. Hardware.
6. Anchors, fasteners, flashings, trim and accessories to complete the work.
7. Sealants required within entrance and window construction.
8. All gaskets, sealants and tapes required in final assembly of the work.
9. Installation of lock cylinders furnished under Section 08 71 10.

1.02 RELATED SECTIONS

A. Joint Sealants: Section 07 92 00.

B. Glass and Glazing: Section 08 81 00.

C. Hardware: Section 08 71 10.

D. Wood Doors: Section 08 14 00.

1.03 QUALITY ASSURANCE

A. Provide aluminum doors and framing system manufactured by a single firm specializing in the production of this type of work.

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1.04 REFERENCES

A. American Architectural Manufacturers Association (AAMA): Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing High Performance Organic Coatings on Architectural Extrusions and Panels, AAMA 2605.

1.05 SUBMITTALS

A. Submit the following:

1. Framing system details.
2. Door details.
3. Installation instructions.
4. Itemized schedule of door hardware.
5. Finish samples.

B. Tests: Submit two copies of test reports made or witnessed by an independent testing laboratory showing the results of tests conducted on previously manufactured windows of the type used on this project. The reports shall verify conformance to thermal movement, air and water infiltration and structural properties as described herein.

C. Building Shop Drawings: Include complete evaluations of all systems including doors; details and methods of anchorage; details of construction finishes; methods of assembly; location and installation of hardware and reinforcement for same; size, shape and thickness of materials; joints and connections; details of joining with other work.

1. Scale: Include typical unit elevation of each system at 1/2" scale and details at full scale where practical.

D. Product Data: Submit manufacturer's specifications for materials and fabrication of work, and instructions and recommendations for installation and maintenance. Include certified test reports showing compliance with requirements where a test method is indicated.

E. Samples: Submit samples of each type and color and finish required by this Section, on 12" sections of extrusions or formed shapes and on 6" squares of sheet/plate. Include two or more samples in each set.

1. Architect reserves right to require fabrication samples showing prime members, joinery, anchorage, expansion provisions, glazing and similar details, profiles and intersections.

1.05 DELIVERY, STORAGE AND HANDLING

A. Pack, deliver, handle, store and protect materials from damage in accordance with AAMA Curtain Wall #10, "Care and Handling of Architectural Aluminum" recommendations.

1. Remove paper type wrappings when unloading.
2. Store materials inside the buildings whenever possible in clean, dry ventilated areas free of dust or corrosive fumes.
3. Stack members vertically or on edge, shim between components to provide

water drainage and ventilation. Protect with adequate coverings, placed to provide adequate air circulation.

4. During installation, protect materials from lime mortar, run-off from concrete and copper, weld splatter, acids, roofing materials, solvents and abrasive cleaner.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.07 WARRANTIES

A. Submit written warranty signed by manufacturer, Contractor, and installer agreeing to repair or replace work which fails in materials or workmanship within three (3) years of the date of project acceptance.

1. Failure of materials or workmanship shall include excessive leakage or air infiltration, excessive deflections and defects in accessories, weather seals and other components of work.

B. Finish: Provide paint manufacturer's guarantee of paint finish against failure of paint finish. Failure includes blistering, peeling, cracking, flaking, checking, excessive color change and chalking. Color change shall not exceed 5 N.B.S. units (per ASTM D523) and chalking shall not less than a rating of 8 per ASTM D4214.

1. Warranty Period: 20 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Drawings and specifications are based on products by KAWNEER CO.

B. Other Acceptable Manufacturers: Equal products by the following manufacturers are acceptable providing they meet or exceed the requirements specified herein and conform to the design intent indicated on the drawings:

1. CRL – U.S. ALUMINUM
2. EFCO
3. OLDCASTLE BUILDING ENVELOPE
4. TUBELITE DIVISION, INDAL, INC.
5. YKK AMERICA
6. BOYD ALUMINUM

2.02 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36.
2. Cold-Rolled Sheet and Strip: ASTM A 1008.
3. Hot-Rolled Sheet and Strip: ASTM A 1011.

2.03 STOREFRONT, WINDOW FRAMING AND ENTRANCE DOOR SYSTEMS

A. Type: An integrated system of extruded aluminum sections, glazing devices, sealing devices, doors and hardware and operable windows.

B. Materials: Provide aluminum alloy and temper for each shape as recommended by manufacturer and processor to comply with requirements of performance, fabrication, and application of finish.

1. Thickness: As required to meet design requirements with a minimum of 1/8" for major sections.

C. Framing: to match existing, framing for 1" insulating glass.

1. Type: Thermally broken, outside glazed, fixed type framing as indicated on drawings.
2. Frame
   a. Members: Main frame members designated specifically for manufacture of aluminum windows extruded from 6063-T5 aluminum alloy.
   b. Glazing: Extruded snap-in type bead. Units to accept 1" insulating glass.
   c. Trim: Provide all trim, sills, flashings and closures to complete installation.
   d. Size
      1) Sightline: Nominal 2".
      2) Depth: 4.5”.
3. Glazing Plane: As indicated
4. Special Framing Shapes: Provide as detailed or as required to maintain design intent as indicated on building elevations drawings and section

drawings. Aluminum extruded shapes and bent aluminum sheet, minimum 0.063", finished after fabrication.

5. Interior Framing: Non-thermally broken to match existing. Units to accept glass thickness indicated.
   a. Designed to resist a 200 lb/SF concentrated load in any direction where indicated on the drawings.
   b. Size
      1) Sightline: Nominal 2".
      2) Sill Sightline: Nominal 4-1/2”
      3) Depth: 4-1/2”.
6. Provide extruded solid backed framing shapes where framing abuts solid wall conditions.

D. Performance Requirements: Exterior storefront system (excluding doors) shall meet or exceed the following performance requirements.

1. Wind loads: Provide storefront system; include anchorage, capable of withstanding wind load design pressures indicated on the drawings.
2. Thermal Movement: Window framing system shall be designed to provide for expansion and contraction of component materials caused by a surface temperature range of 180^{o} F., without causing buckling, stresses on glass, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance, or other detrimental effects.
   a. Doors: Function properly over the above specified temperature range.
3. Air Infiltration: Air leakage shall not exceed 0.06 cfm per square foot of fixed wall area when tested in accordance; with ASTM E283 at test pressure not less than 6.24 psf.
4. Water Infiltration
   a. Provide drainage to exterior face of framing any water entering at joints.
   b. No uncontrolled water penetration shall occur when tested in accordance with ASTM E331, at test pressure not less than 8.0 psf.
5. Structural Properties - Uniform Load: A static air design load of 20 psf shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.
6. Thermal Properties
   a. Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than (Glass to Center) 0.44 (low-e) BTU/hr/ft sq./degree F
   b. Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than (Glass to Center) 62 frame and 68 glass (low-e)

E. Glazed Aluminum Entrance Doors: Standard duty, wide stile, manufacturer's standard, single acting aluminum entrances. Provide thermally broken units without

vestibules

1. Stiles: Nominal 4 ¼” to 5" wide.
2. Rails
   a. Top: 4 ¼” to 5" wide.
   b. Bottom: 10" high.
3. Intermediate Rail: Provide if indicated.
4. Section Wall Thickness: .125" for major components; 0.05" for glazing moldings.
5. Door Thickness: 1-3/4” in vestibules. Provide thermally broken 2 ¼” units without vestibules.
6. Corners: Stiles through design, joined by concealed bolts and weld.
7. Provide complete with snap-in glazing stops and gaskets.
8. Sizes: As indicated. Provide single or pairs of doors as scheduled.
9. Exterior Entrance Weatherstripping: Stile with dual pile weathering with polymeric fin and bulb polymeric weatherstripping and pile weathering with polymeric fin in door frame system or equal by other approved manufacturer. Locate weatherstripping at jambs, head and meeting stiles (as applicable). Provide bottom rail with EPDM blade gasket sweep. Size sweep to close against door threshold. Sweep housing finish to match door finish.
10. Glazing: 1/4" thick in vestibules, insulated units without vestibules, unless otherwise indicated.

2.04 FINISHES

A. Finish: Fluoropolymer baked enamel finish with Kynar 500 (70%) resins by ELF ATOCHEM OF NORTH AMERICA INC.; "Trinar" by AKZO; "Duranar" by PPG; "Fluropon" by VALSPAR. Total dry film thickness not less than 1.0 mils, or coatings meet or exceed the requirements of AAMA 2605.

1. Color: Black.
2. Application: Apply coating systems in strict accordance with manufacturer's printed instructions and recommendations. Refer to Quality Assurance in Part 1.
3. Concealed members may be mill finished, providing they cannot be seen through the glass.

2.05 ENTRANCE DOOR HARDWARE

A. Prepare and reinforce doors and frames for hardware. Factory fit and install hardware in accordance with Section 08 71 10 and manufacturer's requirements.

2.06 ACCESSORIES

A. Fasteners: Aluminum, non-magnetic stainless steel or other materials warranted by manufacturer to be non-corrosive and compatible with aluminum components. Finish exposed fasteners to match aluminum work.

B. Flashing, Trim and Accessories: Provide as required to complete the work. Finish shall match aluminum entrances and storefront finishes. Work includes:

1. Aluminum closure panels, flashing and trim.
2. Concealed Flashing: Dead-soft stainless steel, 26 gauge minimum, type selected by manufacturer for compatibility.
3. All trim materials shall be finished after fabrication, unfinished exposed edges at holes and trim terminations are not acceptable.

C. Brackets and Reinforcements: Manufacturer's high strength aluminum units where feasible; otherwise, nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A123.

D. Bituminous Coatings: Cold applied asphalt mastic complying with SSPC PS 12, compounded for 30 mil thickness per coat.

E. Structural Sealant: Designed to carry gravity loads of glazing and capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed storefront/strip windows without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.

1. Structural Glazing Sealants: ASTM C 1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in storefront/strip windows assembly indicated.
   a. Color: As selected by Architect from manufacturer's full range of colors.
2. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.07 FABRICATION

A. Provide manufacturer's standard fabrication and accessories that comply with indicated requirements. Minor dimension differences will be accepted in order to utilize manufacturer's standard products.

B. Fit and assemble the work at the shop to the greatest extent possible. Disassemble only as required for shipment and erection. Maintain true continuity of line and accurate relation of planes and angles. Provide secure attachment and support at mechanical joints, with hairline fit of contacting members. Conceal fasteners wherever possible.

C. Reinforce aluminum work as necessary at points of support or anchorage and at mechanical joints and points of attachment to meet performance requirements and

for support of the system. Separate dissimilar metals with bituminous paint or preformed separators that will prevent corrosion. Separate metal surfaces at moving joints with plastic inserts or other non-abrasive concealed inserts.

D. Coordinate work of this section with other work for proper sequence of construction without delays. Verify dimensions of supporting structure and other elements that precede wall system work before fabrication of required components. Provide for erection tolerances for other work where field measurements cannot be obtained.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates supporting structure, and installation conditions. Do not proceed with aluminum entrances erection until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

A. General

1. Do not install component parts that are observed to be defective, including warped, bowed, dented, abraded and broken members.
2. Remove and replace members that have been damaged during installation or thereafter before time of acceptance.
3. Do not cut or trim component parts during erection, in a manner which would damage finish, decrease strength or result in a visual imperfection or a failure in performance of the work.

B. Install components in accordance with the manufacturer's installation instructions and recommendations.

C. Install component parts level, plumb, true to line and with uniform joints and reveals. Secure to structure with non-staining and non-corrosive shims, anchors, fasteners, spacers and fillers.

D. Assembly and Anchorage: Anchor component parts securely in place, by bolting or other permanent mechanical attachment system, which will comply with performance requirements and permits movements as required.

1. Anchor storefront sill to a continuous interior aluminum anchor.

E. Apply a bituminous coating or other suitable separator on concealed contact surfaces of dissimilar materials, before assembly or installation to prevent corrosive or electrolytic action.

F. Set sill members and entrance thresholds in a bed of sealant compound, or with joint fillers or gaskets to provide weathertight requirements.

G. Install glass and glazing, in accordance with Section 08 81 00 and the manufacturer's requirements.

H. Install joint sealants specified in Section 07 92 00, in accordance with the manufacturer's requirements.

I. Coordinate installation of storefront framing with installation of air/vapor barrier transition membrane.

J. Adjust operating hardware to function properly, without binding, and to provide tight proper fit at contact points and weatherstripping.

3.03 CLEANING AND PROTECTION

A. Protect glass from breakage immediately upon installation, by attachment of streamers to framing held away from glass. Do not apply markings of any type to surfaces of glass.

B. Remove protective coating when completion of construction activities no longer require its retention.

C. Immediately before acceptance of the work, clean the aluminum entrance systems thoroughly, inside and out. Demonstrate proper cleaning methods to Owner's maintenance personnel during final cleaning. Prepare a "Cleaning and Maintenance Manual" listing types of cleaning compounds, cleaning methods, sealants and glazing materials used for cleaning, repair and maintenance of work and turn over to Owner upon acceptance of the work.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Sliding doors.
3. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Hollow Metal Frames”.
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:

    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of

the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
b. Complete (risers, point-to-point) access control system block wiring diagrams.
c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

1.5 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that

indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.

4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hardware shall not have any visible manufacturer names on exposed materials, except cylinders, when the door is in a closed position.

2.2 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

    a. Two Hinges: For doors with heights up to 60 inches.
    b. Three Hinges: For doors with heights 61 to 90 inches.
    c. Four Hinges: For doors with heights 91 to 120 inches.
    d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

    a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
    b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

    a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
    b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

    a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.

5. Manufacturers:

a. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.3 CONTINUOUS HINGES

A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

a. Pemko (PE).

2.4 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. Pemko (PE) - EL-CEPT Series.
b. Securitron (SU) - EL-CEPT Series.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

a. McKinney (MK) - QC-C Series.

2.5 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:

    a. Rockwood (RO).

B. Coordinators: ANSI/BHMA A156.3 door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.

1. Manufacturers:

    a. Rockwood (RO).

C. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls, where applicable, shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
6. Manufacturers:

    a. Rockwood (RO).

2.6 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Manufacturer's Standard.

C. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. New System: Key locks to a new key system as directed by the Owner.

D. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

E. Construction Keying: Provide construction master keyed cylinders.

F. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.7 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

a. Lund Equipment (LU).

b. MMF Industries (MM).
c. Telkee (TK).

P. Electronic Key Management System: Provide an electronic key control system with Stand-alone Plug and Play features including advanced RFID technology. Touchscreen interface with PIN access for keys individually locked in place. Minimum 1,000 system users and 21 iFobs for locking receptors. System shall have a minimum 250,000 audit events screen displayed or ability to be exported via USB port.

1. Manufacturers:

a. Medeco (MC).

2.8 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

a. ASSA ABLOY ACCENTRA (YA) - 8800FL Series.
b. Corbin Russwin Hardware (RU) - ML2000 Series.
c. Sargent Manufacturing (SA) - 8200 Series.

2.9 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.10 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

    a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
    b. Sargent Manufacturing (SA) - 80 Series.

2.11 SURFACE DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Heavy duty surface mounted door closers shall have a 30-year warranty.

2. Manufacturers:

a. ASSA ABLOY ACCENTRA (YA) - 4400 Series.
b. Corbin Russwin Hardware (RU) - DC6000 Series.
c. Norton Rixson (NO) - 7500 Series.
d. Sargent Manufacturing (SA) - 351 Series.

2.12 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and

provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:

    a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:

    a. Rockwood (RO).

2.13 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

    a. Rockwood (RO).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

    a. Norton Rixson (RF).
    b. Rockwood (RO).
    c. Sargent Manufacturing (SA).

2.14 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where

indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. Pemko (PE).

2.15 ELECTRONIC ACCESSORIES

A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturers:

a. Securitron (SU) - DPS Series.

B. Intelligent Switching Power Supplies: Provide the least number of power supplies at the appropriate amperage level sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Power supplies shall meet all functions and features as specified herein.

a. UL listed dual voltage 12 or 24 VDC field selectable continuous output.
b. Dedicated fast charger to prolong battery life with low battery cutoff to protect batteries from deep discharge.

c. Enhanced surge immunity for input/output protection
d. Separate, dedicated battery charging circuit to keep locks cooler.
e. Dual-color LED visual notification to prevent applying incorrect voltages to the power supply.
f. Instant auto-switch to battery on AC loss.
g. Expandable up to 16 outputs in the standard enclosure
h. Integrated fire alarm interface to allow main output shutdown or disconnect on a per output basis when using an R8 output module.
i. Network ready and remotely manage locks and connected devices when using an M8 managed output module on network models.
j. Lifetime replacement, no-fault, no questions asked warranty.

2. Manufacturers:

a. Securitron (SU) - AQL Series.

2.16 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.17 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.

E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.

3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer's Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. SU - Securitron
4. RO - Rockwood
5. SA - SARGENT
6. YA - ASSA ABLOY ACCENTRA
7. HS - HES
8. RF - Rixson
9. NO - Norton
10. OT - Other
11. AK - Alarm Controls

Hardware Sets

Set: 1.0

Doors: 100, 101A
Description: PR EXISTING ALUM

2	Electric Power Transfer	EL-CEPT	630	SU	
1	Card Reader	By Division 28			OT
2	ElectroLynx Harness	QC-CxxxP (Frame)			MK
2	ElectroLynx Harness	QC-CxxxP (Door)			MK
2	Position Switch	DPS		SU	
1	Power Supply	AQL_ x Amps x Relays (consolidate as applicable)		SU	
1	Wiring Diagram	By Division 28		OT	

Notes: Door normally closed and locked.
Entrance by valid card to card-reader.
Free egress at all times.
Loss of power maintains security from locked side of opening - Entrance by mechanical key only.
Door monitored for door ajar or forced open.

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Immediately inform the Architect of product that may not work with the existing frame and door conditions.
-Use above new hardware, all other hardware to remain.

Set: 2.0

Doors: 101B, 128A, S102A
Description: SGL EXISTING EAC

1	SMART Pac Bridge Rectifier		2005M3	HS	
1	Card Reader		By Division 28		OT
1	ElectroLynx Harness		QC-CxxxP (Frame)		MK
1	ElectroLynx Harness		QC-CxxxP (Door)		MK
1	Position Switch	DPS		SU	
1	Detector		SREX-100		AK
1	Power Supply		AQL_ x Amps x Relays (consolidate as applicable)	SU	
1	Wiring Diagram	By Division 28		OT	

Notes: Door normally closed and locked.
Entrance by valid card to card-reader.
Free egress at all times.
Loss of power maintains security from locked side of opening - Entrance by mechanical key only.
Door monitored for door ajar or forced open.

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Immediately inform the Architect of product that may not work with the existing frame and door conditions.
-Use above new hardware, all other hardware to remain.

Set: 2.1

Doors: 132A, 133A, S101A, S101B, S102B
Description: SGL NEW EAC

1	Electric Strike		1600-CLB	630	HS
1	SMART Pac Bridge Rectifier		2005M3	HS	
1	Card Reader		By Division 28		OT
1	ElectroLynx Harness		QC-CxxxP (Frame)		MK
1	ElectroLynx Harness		QC-CxxxP (Door)		MK
1	Position Switch	DPS		SU	
1	Detector		SREX-100		AK
1	Power Supply		AQL_ x Amps x Relays (consolidate as applicable)	SU	
1	Wiring Diagram	By Division 28		OT	

Notes: Door normally closed and locked.
Entrance by valid card to card-reader.
Free egress at all times.
Loss of power maintains security from locked side of opening - Entrance by mechanical key only.
Door monitored for door ajar or forced open.

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Immediately inform the Architect of product that may not work with the existing frame and door conditions.
-Use above new hardware, all other hardware to remain.

Set: 3.0

Door: 131A
Description: SGL EXT ELEC STORAGE - CLOSER w OHS

1	Continuous Hinge	CFM_SLF-HD1 PT x Length Required			PE
1	Electric Power Transfer	EL-CEPT	630	SU	
1	Rim Exit Device, Storeroom	55 56 AD8504 862		US26D	SA
1	Conc Overhead Stop	6-x36		630	RF
1	Surface Closer	7500	626	NO	
1	Gasketing	by door mfg			OT
1	Rain Guard	346C			PE
1	Sweep	345C			PE
1	Threshold	252x__FG			PE
1	Card Reader	By Division 28			OT
1	ElectroLynx Harness	QC-CxxxP (Frame)			MK
1	ElectroLynx Harness	QC-CxxxP (Door)			MK
1	Position Switch	DPS		SU	
1	Power Supply	AQL_ x Amps x Relays (consolidate as applicable)		SU	
1	Wiring Diagram	By Division 28		OT	

Notes: Door normally closed and locked.
Entrance by valid card to card-reader.
Free egress at all times.
Loss of power maintains security from locked side of opening - Entrance by mechanical key only.
Door monitored for door ajar or forced open.

Set: 4.0

Door: 147A
Description: PR EXISTING WD

1	Electric Power Transfer	EL-CEPT	630	SU	
1	Card Reader	By Division 28			OT
1	ElectroLynx Harness	QC-CxxxP (Frame)			MK
1	ElectroLynx Harness	QC-CxxxP (Door)			MK
1	Position Switch	DPS		SU	
1	Power Supply	AQL_ x Amps x Relays (consolidate as applicable)		SU	
1	Wiring Diagram	By Division 28		OT	

Notes: Door normally closed and locked.
Entrance by valid card to card-reader.
Free egress at all times.
Loss of power maintains security from locked side of opening - Entrance by mechanical key only.
Door monitored for door ajar or forced open.

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Immediately inform the Architect of product that may not work with the existing frame and door conditions.
-Use above new hardware, all other hardware to remain.

Set: 5.0

Doors: 121A, 121B
Description: SGL ELEC INT STORAGE - CLOSER w WALL STOP - EXIT

3	Hinge, Full Mortise	TA2714 QC* (size per spec, NRP as applicable)		US26D	MK
1	Electric Power Transfer	EL-CEPT	630	SU	
1	Rim Exit Device, Storeroom	55 56 AD8504 862		US26D	SA
1	Surface Closer	7500	626	NO	
1	Kick Plate	K1050 10" High CSK BEV		US32D	RO
1	Wall Stop	409		US26D	RO
1	Gasketing	608			PE
1	Card Reader	By Division 28			OT
1	ElectroLynx Harness	QC-CxxxP (Frame)			MK
1	ElectroLynx Harness	QC-CxxxP (Door)			MK
1	Position Switch	DPS		SU	
1	Power Supply	AQL_ x Amps x Relays (consolidate as applicable)		SU	
1	Wiring Diagram	By Division 28		OT	

Notes: Door normally closed and locked.
Entrance by valid card to card-reader.
Free egress at all times.
Loss of power maintains security from locked side of opening - Entrance by mechanical key only.
Door monitored for door ajar or forced open.

Set: 6.0

Door: 110A
Description: PR INT PASSAGE - OHS

6	Hinge, Full Mortise, Hvy Wt	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Flush Bolt	2842	US32D	RO

1	Dust Proof Strike	570		US26D	RO
1	Passage Latch	8215 LSJ	US26D	SA	
1	Coordinator	1700		Black	RO
2	Surf Overhead Stop	10-x36		630	RF
2	Kick Plate	K1050 10" High CSK BEV		US32D	RO
1	Astragal	357			PE
1	Gasketing	608			PE

Set: 6.1

Door: 122
Description: PR INT PUSH/PULL - CLOSER w OHS

6	Hinge, Full Mortise, Hvy Wt	T4A3786 (size per spec, NRP as applicable)	US26D	MK	
1	Push Plate	70C-RKW		US32D	RO
1	Pull Plate	110x70C		US32D	RO
1	Coordinator	1700		Black	RO
2	Surf Overhead Stop	10-x36		630	RF
2	Surface Closer	7500	626	NO	
2	Kick Plate	K1050 10" High CSK BEV		US32D	RO
1	Astragal	357			PE
1	Gasketing	608			PE

Set: 6.2

Door: 126B
Description: PR INT PASSAGE - OHS

6	Hinge, Full Mortise, Hvy Wt	T4A3786 (size per spec, NRP as applicable)	US26D	MK	
1	Flush Bolt	2842		US32D	RO
1	Dust Proof Strike	570		US26D	RO
1	Office Latch	8205 LSJ		US26D	SA
1	Coordinator	1700		Black	RO
2	Floor Stop	446		US26D	RO
2	Kick Plate	K1050 10" High CSK BEV		US32D	RO

Set: 7.0

Doors: 104, 110, 121A, 121B
Description: SGL ELEC INT STORAGE - CLOSER w WALL STOP

3	Hinge, Full Mortise	TA2714 QC* (size per spec, NRP as applicable)		US26D	MK
1	Electric Power Transfer	EL-CEPT	630	SU	
1	Storeroom/Closet Lock	RX 56 8204 LSJ	US26D	SA	
1	Surface Closer	7500	626	NO	
1	Kick Plate	K1050 10" High CSK BEV		US32D	RO
1	Wall Stop	409 US26D RO			
1	Gasketing	608 / S88 at fire rated openings			PE

1	Card Reader		By Division 28		OT
1	ElectroLynx Harness		QC-CxxxP (Frame)		MK
1	ElectroLynx Harness		QC-CxxxP (Door)		MK
1	Position Switch	DPS		SU	
1	Power Supply		AQL_ x Amps x Relays (consolidate as applicable)	SU	
1	Wiring Diagram	By Division 28		OT	

Notes: Door normally closed and locked.
Entrance by valid card to card-reader.
Free egress at all times.
Loss of power maintains security from locked side of opening - Entrance by mechanical key only.
Door monitored for door ajar or forced open.

Set: 8.0

Doors: 142
Description: SGL INT STORAGE - CLOSER w STOP

3	Hinge, Full Mortise		TA2714 (size per spec, NRP as applicable)	US26D	MK
1	Storeroom/Closet Lock	8204 LSJ		US32D	SA
1	Surface Closer	CPS7500		626	NO
1	Kick Plate		K1050 10" High CSK BEV	US32D	RO
1	Gasketing		608		PE

Set: 9.0

Doors: 140
Description: SGL INT ELEC STORAGE - CLOSER w OHS

3	Hinge, Full Mortise		TA2714 QC* (size per spec, NRP as applicable)	US26D	MK
1	Storeroom/Closet Lock	RX 56 8204 LSJ		US26D	SA
1	Surf Overhead Stop		9-x36	630	RF
1	Surface Closer	7500		626	NO
1	Kick Plate		K1050 10" High CSK BEV	US32D	RO
1	Gasketing		608		PE
1	Card Reader		By Division 28		OT
1	ElectroLynx Harness		QC-CxxxP (Frame)		MK
1	ElectroLynx Harness		QC-CxxxP (Door)		MK
1	Position Switch	DPS		SU	
1	Power Supply		AQL_ x Amps x Relays (consolidate as applicable)	SU	
1	Wiring Diagram	By Division 28		OT	

Notes: Door normally closed and locked.
Entrance by valid card to card-reader.
Free egress at all times.

Loss of power maintains security from locked side of opening - Entrance by mechanical key only.
Door monitored for door ajar or forced open.

Set: 10.0

Doors: 129
Description: SGL INT PASSAGE - CLOSER w WALL STOP

3	Hinge, Full Mortise	TA2714 (size per spec, NRP as applicable)	US26D	MK	
1	Passage Latch	8215 LSJ	US26D	SA	
1	Surface Closer	2800ST 626	NO		
1	Kick Plate	K1050 10" High CSK BEV	US32D	RO	
1	Wall Stop	409	US26D	RO	
1	Gasketing	608		PE	

Set: 11.0

Doors: 131B
Description: SGL INT PASSAGE - CLOSER w OHS

3	Hinge, Full Mortise, Hvy Wt	T4A3786 (size per spec)	US26D	MK	
1	Push Plate	70C-RKW	US32D	RO	
1	Pull Plate	110x70C	US32D	RO	
1	Surface Closer	UNI7500 600x689	NO		
1	Kick Plate	K1050 10" High CSK BEV	US32D	RO	
1	Gasketing	608		PE	

Set: 12.0

Doors: 133B
Description: SGL ELEC INT STORAGE - CLOSER w STOP

3	Hinge, Full Mortise	TA2714 QC* (size per spec, NRP as applicable)	US26D	MK	
1	Storeroom/Closet Lock	RX 56 8204 LSJ	US26D	SA	
1	Surface Closer	CPS7500	626	NO	
1	Kick Plate	K1050 10" High CSK BEV	US32D	RO	
1	Gasketing	608		PE	
1	Card Reader	By Division 28		OT	
1	ElectroLynx Harness	QC-CxxxP (Frame)		MK	
1	ElectroLynx Harness	QC-CxxxP (Door)		MK	
1	Position Switch	DPS		SU	
1	Power Supply	AQL_ x Amps x Relays (consolidate as applicable)		SU	
1	Wiring Diagram	By Division 28		OT	

Notes: Door normally closed and locked.
Entrance by valid card to card-reader.
Free egress at all times.

Loss of power maintains security from locked side of opening - Entrance by mechanical key only.
Door monitored for door ajar or forced open.

END OF SECTION

SECTION 08 81 00

GLASS AND GLAZING

PART 1 GENERAL

1.01 SCOPE

A. Work Included: Provide glass and glazing for all exterior and interior openings as indicated on the drawings and specified herein.

1.02 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thicknesses indicated or specified are minimums and are for detailing purposes only. Confirm glass thickness by analyzing project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet, as a minimum, the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E1300, according to the following requirements:
   a. Specified Design Wind Loads: 30 psf.
   b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical under wind action.
      1) Load Duration: 60 seconds or less.
   c. Probability of Breakage for Sloped Glazing: 1 lite per 1000 lites set more than 15 degrees off vertical and under wind and snow action.
      1) Load Duration: 30 days.
   d. Maximum Lateral Deflection: For the following types of glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1", whichever is less.
      1) For monolithic glass lites, heat treated to resist wind loads.
      2) For insulating glass.
      3) For laminated glass lites.
   e. Minimum Glass Thickness for Exterior Lites" ¼".

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering

calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120° F, ambient; 180° F, material surfaces.

1.03 REFERENCED STANDARDS

A. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard.

1. AAMA: American Architectural Manufacturers Association.
2. ANSI: American National Standards Institute.
3. ASTM: American Society for Testing and Materials.
4. GANA: Glass Association of North America.
5. IGMA: Insulated Glass Manufacturers Alliance.
6. NFPA: National Fire Protection Association.
7. IGCC: Insulating Glass Certification Council.

B. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations listed below, except where more stringent requirements are indicated herein.

1. Glass Association of North America (GANA) "Glazing Manual."
2. Insulated Glass Manufacturers Alliance (IGMA)
   a. TM-3000 "Vertical Glazing Guidelines"
   b. TB-3001 "Sloped Glazing Guidelines".
3. American Architectural Manufacturers Association (AAMA)
   a. TIR-A7 "Sloped Glazing Guidelines"
   b. GDSG-1 "Glass Design for Sloped Glazing".

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this project.

B. Safety Glass Standards: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.

1. Each lite shall bear permanent, non-removable label manufacturers designation of safety glazing standard for which it complies.

C. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or on at least one component lite of unit with appropriate certification label of Insulating Glass Certification Council (IGCC).

D. Allowable Tolerances: Thicknesses of glass specified are nominal; provide glass manufactured to tolerances listed in GANA Manual.

1. Interior Glass Partition Thickness: Provide recommended minimum

thickness for fully tempered glass used in fixed interior panels mounted or restrained at top and bottom or fully captured systems as required.

1.05 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of glass, glazing sealants and accessories required.

1. Indicate structural, physical and environmental characteristics, size limitations, special handling requirements, etc.

B. Submit insulating glass manufacturer's certification indicating units meet or exceed specified requirements.

C. Shop Drawings: Required data for shop drawings on glazing may be incorporated with shop drawings for framing members. Show thicknesses of glass; proposed "bites" in frames, sizes and locations of blocks, clips, beads, stops edge treatments; note quality, type and strength of each lite.

D. Samples: Submit and obtain approval of samples before proceeding with glass fabrication. Minimum two 12" x 12" samples of each glass type required, except clear monolithic glass. Submit color samples of exposed sealants and/or gaskets.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle glazing materials in accordance with manufacturer's recommendations to prevent damage and deterioration.

B. Various items to receive glazing as specified elsewhere may be factory-glazed or site-glazed at Contractor's option.

C. Deliver glazing compounds and sealants in manufacturer's unopened labeled containers.

D. Deliver glass with manufacturer's labels intact. Do not remove labels until glass has been installed.

1.07 PROJECT CONDITIONS

A. Field verify measurements and conditions of installations.

B. Examine all details. Provide proper fitting for details indicated.

C. Do not perform work under adverse weather or job site conditions. Install liquid sealants when temperatures are within lower or middle third of temperature range recommendations by manufacturer.

D. Protect work from damage during and after installation until project acceptance.

1.08 WARRANTY

A. Contractor to guarantee work under this Section against defects of materials, fabrication and installation. Guarantee period is one year, except where specified otherwise. Defects include, but are not necessarily limited to:

1. Weather tightness: Two (2) year warranty.

B. Insulating Glass: Submit manufacturer's written warranty that for ten (10) years from date of substantial completion, a replacement will be provided (furnished and installed) for any unit which develops edge separation, thermal stress cracks, or other defects which materially obstruct vision through the glass or affect thermal and physical integrity of insulating glass units, except warranty shall not cover glass breakage from other than natural causes. Defective units shall be replaced at no additional cost to the Owner.

C. Coated Glass: Submit manufacturer's written warranty that for five (5) years from date of substantial completion, a replacement will be provided for defective units. Defects are defined as peeling, cracking or deterioration in coating due to normal conditions and not due to handling or installation contrary to glass manufacturer's published instructions. Defective units shall be replaced at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturers and Fabricators: Specifications herein are based on glass and materials manufactured or fabricated by the following companies. Not all firms listed manufacture or fabricate all the items specified herein. However, to ensure consistent quality of appearance and performance, provide each type or kind of glass or material from a single source. Manufacturers for specialty products are listed within the specification to establish a particular type, color, pattern, etc. Equal products by the manufacturers listed are acceptable providing they meet the type, color, pattern, etc. as approved by the Architect.

1. Manufacturers
    a. AGC FLOAT GLASS NORTH AMERICA
    b. VITRO
    c. GUARDIAN INDUSTRIES
    d. SAINT GOBAIN
2. Fabricators
    a. VIRACON
    b. OLDCASTLE BUILDINGENVELOPE
    c. ARCH ALUMINUM & GLASS LLC
    d. TRULITE GLASS AND ALUMINUM

2.02 PRIMARY FLOAT GLASS

A. Conformance: Type I, Class 1 for clear glass, Quality q^3, conforming to ASTM C1036.

B. Thickness: 1/4", unless otherwise indicated.

C. Color: Clear.

1. When used in insulating units, provide color specified under each insulating unit.

2.03 HEAT TREATED FLOAT GLASS

A. Conformance: Condition A, Kind FT, Type I, Class 1 for clear glass conforming to ASTM C1048.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
2. Roll Wave Maximum Distortion Tolerance: 0.003 inch target with 0.005 inch maximum peak to valley measurement.
3. Bow and Warp Maximum Tolerance: 50 percent of the maximum allowed in ASTM C 1048.

B. Thickness: 1/4", unless otherwise indicated.

C. Color: Clear.

1. When used in insulating units, provide color specified under each insulating unit.

D. Locations: Safety glazing locations as designated and required by applicable code(s) and where indicated.

2.04 COATED FLOAT GLASS

A. General: Provide coated glass complying with this article and in schedules at the end of Part 3.

B. Low E, Sputter Coated Float Glass: Float glass with metallic-oxide or metallic nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), complying with requirements specified in schedules at end of Part 3.

2.05 WIRE GLASS

A. Wire Glass: USE PROHIBITED.

2.06 INSULATING GLASS

A. Sealed Insulating Glass: General: Provide preassembled units consisting of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E2190 for performance classification indicated as well as with other requirements specified for glass characteristics, air space, sealing system, sealant, spacer material, corner design and desiccant.

1. For properties of individual glass making up units, refer to requirements specified in schedule at the end of Part 3 as applicable to types, kinds, classes and conditions.
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 to comply with glass design requirements. Provide Kind FT (fully tempered) where safety glass is indicated or required.

B. Warm Edge Spacer Construction: Combination of stainless steel and polypropylene. Double sealed with a primary seal of polyisobutylene and a secondary seal of silicone. Delete low-E coating prior to fabrication of insulating units according to coated glass manufacturer’s instructions.

1. Spacer to be black; clear aluminum color not permitted.

2.07 GLAZING MATERIALS AND ACCESSORIES

A. Glazing Sealants and Compounds:

1. Comply with manufacturer's recommendations for selection of hardness. Select materials and variations or modifications for compatibility with surfaces contacted in the installation.
2. Exterior Glazing: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience. Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
    a. Glazing Sealant: One-part neutral-curing silicone glazing sealant, ASTM C 920 Class A, Type S, Grade NS, Class 100/50, Use NT; for high movement joints at metal-to metal and glass to metal.
        1) Dow Corning Corporation; 790
        2) GE Advanced Materials - Silicones; SilPruf LM SCS2700
        3) Pecora Corporation; 890
        4) Tremco Incorporated; Spectrem 1
    b. Glazing Sealant: One-part neutral-curing silicone glazing sealant, ASTM C 920, Type S, Grade NS, Class 50, Use NT; for general applications in glazing installation subject to high movement including perimeter; use non-staining formula at absorbent perimeter applications
        1) DOW CORNING CORPORATION; 795 or 756 SMS
        2) GE ADVANCED MATERIALS -SILICONES; SilPruf NB SCS9000 or SilPruf SCS2000

3) PECORA CORPORATION; 864
4) TREMCO INCORPORATED; Spectrem 2

c. Glazing Sealant: One-part neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT; for general applications in glazing installation including perimeter; use non-staining formula at absorbent perimeter applications.
1) DOW CORNING CORPORATION; 791
2) GE ADVANCEDMATERIALS-SILICONES; UltraGlaze SSG4000 or UltraGlaze SSG4000AC
3) TREMCO INCORPORATED; Proglaze SSG or Tremsil 600

3. Interior Glazing: Compound of polymerized butyl rubber and inert fillers, with or without polyisobutylene modification, solvent based, 95% solids, formed and coiled on release paper, tack-free in 24 hours, paintable, non-staining.

B. Miscellaneous Glazing Materials

1. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
2. Setting Blocks: Neoprene or EPDM, 80-90 durometer hardness, with proven compatibility with sealants used.
3. Spacers: EPDM, 40-50 durometer hardness with proven compatibility with sealants used.
4. Compressible Filler (Rod): Closed cell or waterproof jacketed rod stock of synthetic rubber or plastic form, compatible space with sealants used, flexible and resilient, with 5-10 psi compression strength for 25% deflection.

2.08 FABRICATION

A. General: Fabricate glass and other glazing products in sizes required to glaze openings indicated, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

1. Glass Thickness: Design analyze and comply with published recommendations of glass product manufacturers and organizations listed herein.

B. Glass Cutting: Cut glass to accurate sizes and shapes as indicated on drawings. Allow edge clearances and tolerances in accordance with GANA recommendations.

1. Edges: Provide factory-cutting and factory-formed edges for all butt-glazed, heat tempered and insulating glass. Provide ground edges for all drilled holes, notches and other fabrication or finishing techniques.
2. Butt-Glazed Systems: All work in accordance with manufacturer's recommendations.
a. Edges Exposed to Air: Polished finish.
b. Edges Receiving Sealant: "Suede" finish.

c. Concealed Edges: Factory option.

C. Heat Strengthened and Tempered Glass

1. Heat Strengthened: Heat treated to strengthen glass in bending to not less than 2.0 times annealed strength for the strengthened glass.
2. Tempered: Heat treated to strengthen glass in bending to not less than 4 to 5 times annealed glass strength for the strengthened glass.
3. Cut glass to required size before tempering. Comply with Glass Tempering Association recommendations.
4. Provide tongless tempered glass. When size limitations require tong edges, support each piece during tempering process so that tong marks will be concealed in the glazed system.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates, substructure and installation conditions. Do not proceed with glazing work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PROTECTION AND PREPARATION

A. Protect glass from edge damage during handling and installation. Remove and legally dispose damaged glass off of the project site. Damaged glass is defined as glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and/or appearance.

B. Do not cut, seam, nip or abrade tempered glass.

C. Inspect each piece of glass immediately before installation and eliminate any which have observable edge damage or face imperfections.

D. Unify appearance of each series of lights by setting each piece to match other pieces, as nearly as possible. Inspect each piece and set with pattern, draw, and bow oriented in same direction as other pieces.

E. Clean glazing channels and other framing members to receive glass immediately before glazing. Remove loose coatings. Apply primer to joint surfaces receiving sealants when recommended by sealant manufacturer.

3.03 INSTALLATION - GENERAL

A. Comply with combined recommendations and technical reports of manufacturer's of glass and glazing materials used with GANA "Glazing Manual", except when more stringent requirements are indicated.

B. Install insulating units to comply with recommendations by IGMA, except as otherwise specifically indicated or recommended by glass and sealant manufacturers.

C. Glazing channel dimensions shown are intended to provide for necessary bite on glass, minimum edge clearance and adequate sealant thickness, with reasonable tolerance. Adjust as required by job conditions at time of installation.

D. Install setting blocks in sill rabbets, properly sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Install primers, sealants, tapes, and gaskets in accordance with manufacturer's recommendations. Set glass without springing and install securely to prevent rattling or breakage.

F. Where wedge-shaped gaskets are driven into one side of the channel to pressurize the sealant or gasket on the opposite side, provide adequate anchorage to ensure gasket will not "walk" out when subjected to dynamic movement. Anchor gasket to stop with matching ribs, or by proved adhesives, including embedment of gasket tail in cured heal bead.

1. Miter cut and bond gasket ends together at corners where gaskets will not pull away from corners and result in voids or leaks in the glazing system.

G. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

H. Coordinate aluminum framing systems work with other work for proper sequence of construction. Verify dimensions of supporting structure and other elements which precede wall system work before fabrication of required components. Provide for erection tolerances for other work where field measurements cannot be obtained.

3.04 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes edge-to-edge, but not necessarily in one continuous length. Do not stretch tapes to make them fit openings.

C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together,

not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.05 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center glass lites in openings on setting blocks and press firmly against soft compression gaskets by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.06 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealant to provide a substantial wash away from glass.

3.07 PROTECTION AND CLEANING

A. Protect glass from breakage immediately upon installation by attachment of streamers to framing held away from glass. Do not apply markers of any type to surfaces of glass. Remove non-permanent labels and clean surfaces.

B. Maintain glass in a reasonable clean condition during construction so that it will not

be damaged by corrosive action, and will not contribute (by wash off) to the deterioration of glazing materials and other work. Remove and replace glass which is broken, chipped, cracked, abraded, or damaged in other ways during construction period, including natural causes, accidents and vandalism.

C. Wash and polish on both faces not more than four days before acceptance of the work. Comply with glass manufacturer's recommendations for final cleaning.

3.08 GLAZING SCHEDULE

A. Basis of Design Products: Glass types and products below are based on listed manufacturer.

1. Other Acceptable Manufacturers: Equal products by other manufacturers listed in Part 2 herein are acceptable providing they meet or exceed the performance requirements specified herein and conform to the design intent as determined by the Architect:

B. Insulating Glass

1. Type: Two thicknesses of float or tempered glass, as required by code.
2. Glass/Color
    a. Interior Pane
        1) IG-1
            a) Type I (transparent, flat)
            b) Class 1 (clear)
            c) Quality q3 (select)
        2) IG-1A
            a) Type 1 (transparent, flat)
            b) Kind: FT (fully tempered)
            c) Class 1 (clear)
            d) Quality q3 (select)
    b. Exterior Pane: Match existing
        1) IG-1
            a) Type I (transparent, flat)
            b) Class 1 (clear)
            c) Quality q3 (select)
            d) Low-Emissivity Coating: Sputtered on #2 surface.
        2) IG-1A
            a) Type 1 (transparent, flat)
            b) Kind: FT (fully tempered)
            c) Class 1 (clear)
            d) Quality q3 (select)
            e) Low-Emissivity Coating: Sputtered on #2 surface.
3. Unit Thickness: 1" (two 1/4" panes and 1/2" air space).
4. Thermal Conductance (U-Value): 0.20 Summer Daytime.
5. Transmittance
    a. Ultraviolet %: 6.
    b. Visible %: 40.

c. Solar %: 17.

6. Solar Factor (SHGC): 0.21.

C. Interior Glass

1. Type: One thickness of float or tempered glass.
2. Glass/Color
   a. Interior Pane
      1) GL-1
         a) Type I (transparent, flat)
         b) Class 1 (clear)
         c) Quality q3 (select)
      2) GL-1A
         a) Type 1 (transparent, flat)
         b) Kind: FT (fully tempered)
         c) Class 1 (clear)
         d) Quality q3 (select)

END OF SECTION

SECTION 08 87 00

DECORATIVE WINDOW FILM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Decorative films.

1.02 REFERENCE STANDARDS

A. ASTM E903 - Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.

1.03 DEFINITIONS

A. Visible Light Transmittance: The ratio of the amount of visible light (380-780 nm) that is allowed to pass through a glazing system to the amount of visible light falling on the glazing system. The value is expressed as a percentage.

B. Privacy Film Rating: This number, between 0 (clear) and 10 (opaque), represents the relative difficulty an observer has in identifying the nature and character of an object located on the opposite side of the window, with the observer and the object both located at least 2 feet from the pane upon which the product has been installed.

C. Frost Series: These films have frosted and translucent finishes that ensure privacy without sacrificing natural light. They are ideal for commercial interior glazing applications such as office partitions or to meet interior design goals at a fraction of the cost of etched glass.

1.04 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Decorative Film Samples: For each type of decorative glass, 12 inches square.

C. Product Certificates: For each type of decorative film.

D. Sample Warranty: For special warranty.

1.06 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.07 QUALITY ASSURANCE

A. Qualification Data: Submit documentation indicating qualifications of decorative film manufacturer.

B. Qualification Data: Submit documentation indicating qualifications of decorative film installer. Installer shall be approved by the decorative film manufacturer.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle materials in manufacturer's protective packaging.

B. Store and protect materials according to manufacturer's written recommendations to prevent damage from condensation, temperature changes, direct exposure to sun, or other causes.

1.09 SITE CONDITIONS

A. Ambient Conditions: Maintain temperature, humidity, and ventilation within limits recommended by manufacturer.

PART 2 PRODUCTS

2.01 DECORATIVE WINDOW FILM: WF-1

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. 3M; https://www.3m.com/.
2. Llumar Decorative Films; https://llumar.com/na/en/architectural/commercial window-film/.
3. Solyx; https://www.solyxfilms.com/ (Basis of Design).

B. Style: High-grade embossed vinyl film.

C. Width: 60 inches.

D. Thickness: 4 mil.

E. Adhesive Type: Pressure-Sensitive.

F. Color: As selected by architect and designer from manufacturer's full range to coordinate with final curtain wall product.

2.02 INSTALLATION MATERIALS

A. General: Provide accessories either manufactured by or acceptable to Decorative fil manufacturer for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Pressure Sensitive Adhesive: This adhesive is activated by pressure and water. It is characterized by its permanently tacky nature and its installation ease.

1. Clear, pressure-sensitive adhesive as recommended by manufacturer.

C. Cleaners and primers: As recommended by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for compliance with requirements and for conditions affecting performance of decorative film including glass that is broken, chipped, cracked, abraded, or damaged in any way.

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

3.02 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates thoroughly prior to installation.

C. Prepare substrates using methods recommended by film manufacturer to achieve the best results for the substrate under project conditions.

D. Protect window frames and surrounding surfaces to prevent damage during installation.

3.03 INSTALLATION

A. Install in accordance with manufacturer's written instructions.

B. Install with no gaps or overlaps.

C. If seamed, make seams non-overlapping.

D. Do not remove release liner from film until just before each piece of film is cut and ready for installation.

E. Custom cut to the glass with neat, square corners and edges to within 1/8-inch of the window frame.

F. Remove air bubbles, blisters, and other defects. Be careful to remove "fingers" to eliminate any contamination or excess water pockets. It is crucial to remove as

much water as possible during installation.

3.04 FIELD QUALITY CONTROL

A. After installation, view film from a distance of 10 feet against a bright uniform sky or background. Film shall appear uniform in appearance with no visible streaks, wrinkles, banding, thin spots or pinholes.

B. If installed film does not meet these criteria, remove and replace with new film.

3.05 CLEANING AND PROTECTION

A. Remove excess mounting solution at finished seams, perimeter edges, and adjacent surfaces.

B. Use cleaning methods recommended by film manufacturer.

C. Replace films that cannot be cleaned.

D. Protect installed products until completion of project.

E. Touch-up, repair or replace damaged products before substantial completion.

3.06 CLEANING AND PROTECTION

A. Immediately after installation, remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Remove and replace glass that is damaged during construction period.

END OF SECTION

SECTION 09 21 16

GYPSUM BOARD SYSTEMS

PART 1 GENERAL

1.01 SCOPE

A. Provide gypsum board systems consisting of wall board and framing as indicated and specified. Work includes:

1. Gypsum board and light gage framing wall systems.
2. Suspended gypsum board ceilings and soffits including suspension framing system.
3. Edge trim, corner beads, control joints, accent reveals, fasteners, joint treatment materials and other accessories required for a complete installation.
4. Includes installation of acoustical insulation.
5. Installation of metal access doors, including those provided by Plumbing and HVAC Contractors. See Section 08 31 13 and Divisions 22 and 23.

1.02 RELATED SECTIONS

A. Sealant: Section 07 92 00.

1.03 QUALITY ASSURANCE

A. Gypsum Board Systems: Comply with ASTM C840 "Application and Finishing of Gypsum Board", and as specified.

B. Metal Framing System: Comply with ASTM C754 "Installation of Steel Framing Members to Receive Screw Attached Gypsum", and as specified.

1. Performance Requirements: Design framing systems in accordance with AISI S220
2. Horizontal Deflection: For wall assemblies, limited to L/240 with 5 psf lateral loading of the wall.

C. Reference Standards: Wherever the following abbreviations are used herein they shall refer to the corresponding standard:

1. ASTM: American Society for Testing and Materials.
2. GA: Gypsum Association.
3. AISI: American Iron and Steel Institute

D. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to

ASTM E90 and classified according to ASTM E413 by an independent testing agency.

E. Guarantee: Submit written guarantee stating that cracks, delaminations or other imperfections in the drywall work which may develop within a period of 2 years from date of acceptance will be repaired at no cost to the Owner.

F. Pre-Installation Conference: Conduct a pre-installation conference at Project site to review manufacturer's recommendations and referenced requirements for locating control joints in gypsum board walls and ceilings a minimum of one (1) week prior to beginning this portion of the Work. Have manufacturer's representative, contractor's representative and Architect present at this meeting.

1.04 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each gypsum board system component.

B. Submit manufacturer's certification that fire-rated assemblies proposed meet project requirements, including evidence of approved test reports acceptable to governing building code enforcing authorities, that assemblies when installed with proposed materials, will meet or exceed fire ratings required.

C. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Framing Industry Association (SFIA) or be a part of a similar organization that provides verifiable code compliance program.

D. Evaluation Reports: Submit evaluation reports certified under an independent third-party inspection program administered by an agency accredited by IAS to ICC-ES AC98 accreditation criteria for inspection agencies

a. Equivalent Framing: Comply with applicable ASTM C 645 allowing provision that allows framing members that do not meet the minimum base-steel thickness and sectional or section properties if they are certified according to ICC-ES AC86 by third-party testing and conform to the limiting-height tables in ASTM C 754. Provide manufacturers of embossed framing members make copies of third-party certification report

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original, unopened labeled containers.

B. Store, protect and handle materials in accordance with manufacturer's recommendations to prevent damage, soiling and deterioration. Protect cold-formed metal framing from corrosion, deformation and other damage during delivery, storage and handing per requirements of AISI's "Code of Standard Practice".

C. Protect adjoining surfaces against damage and soiling.

1.06 JOB CONDITIONS

A. Coordinate installation sequencing with work of other trades.

1. Verify completion of other work, including that of other trades, which will be concealed by gypsum drywall construction before installation of wallboard.

1.07 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gypsum Board: U.S. GYPSUM CO.; CERTAINTEED CORP.; GEORGIA-PACIFIC CORP.; NATIONAL GYPSUM COMPANY; CONTINENTAL BUILDING PRODUCTS.

B. Studs, Framing and Furring: CLARK DIETRICH BUILDING SYSTEMS; MARINO/WARE; STATE BUILDING PRODUCTS.

C. Others as listed for specific products.

2.02 STEEL FRAMING SYSTEMS

A. Type: Screw type "C" shape, roll formed sheet steel members conforming to requirements of ASTM C645 and AISI S220.

1. Material: ASTM A653 steel with minimum yield strength of 33 ksi.
2. Finish: Hot-dip galvanized coating, complying with AISI S220; ASTM A653 G40 (Z120), or coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40 (Z120). Galvannealed products are not acceptable.
   a. Coatings shall demonstrate equivalent corrosion resistance with an evaluation report acceptable to the authorities having jurisdiction.
   b. Provide G90 at natatorium areas as applicable.
3. Gage and Width – 3-5/8” to 6” Studs
   a. 25 gage x 3-5/8": Up to and including 14'-6" high.
   b. 20 gage x 3-5/8"
      1) Over 14'-6" up to and including 16'-5" high
      2) At wall mounted cabinet and countertop locations
      3) At walls receiving ceramic tile
   c. 20 gage x 4": Over 16'-5" up to and including 17'-6" high
   d. 20 gage x 6": Over 17'-6" up to and including 24'-0".

e. 16 gage at door jambs, heavy equipment locations, and interior partitions receiving masonry veneer.
f. Provide other gages or widths as indicated on drawings.

4. Gage and Width – 1-5/8” to 2-1/2” Studs
   a. 25 gage x 1-5/8”: Maximum height 8’-4”
   b. 20 gage x 1-5/8”: Maximum height 9’-8”
   c. 25 gage x 2-1/2”: Maximum height 11’-3”
   a. 20 gage x 2-1/2”: Maximum height 12’-10”
5. Flange Width: Nominal 1-1/4".

B. Runners and Tracks: Designed and sized to receive studs. Thickness to match studs except deflection tracks. All thicknesses are minimum bare metal.

1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; 0.0296” thickness and in width to accommodate depth of studs. Provide one of the following:
   a. 0.0296” top track with 2” minimum legs and 0.0329” Spazzer 9200 Stud Spacer Bar by CLARK DIETRICH BUILDING SYSTEMS
   b. Slip Track (Slp Trk) by BRADY CONSTRUCTION INOVATIONS
   c. The System by METAL-LITE
   d. The Three Legged Dog by FLEX-ABILITY CONCEPTS.
   e. A double slip track, 0.0296”, can be used in lieu of the proprietary deflection tracks specified above. Legs of tracks shall be minimum 2".

C. Backing Plates (Blocking): Steel sheet for blocking; width to fit framing spacing; height to be 6” unless otherwise indicated.

1. Base steel Thickness: Minimum 0.0296”.

2.03 CEILING/SOFFIT SUSPENSION SYSTEM

A. Provide the following materials unless otherwise indicated on the drawings. Metals used in exterior or areas subjected to moisture to be hot-dipped galvanized in accordance with ASTM A653 G40.

1. Main Runners: Cold-rolled steel channels; not less than 0.0538”; G90 galvanized finish for exterior and moist areas, black asphaltum painted for other areas. Spacing as required, but not to exceed 48" o.c.
   a. 1-1/2" deep where structural support framing is at 48" o.c. or less.
   b. 2" deep where structural support framing is over 48" and less than 66" o.c.
2. Cross Furring
   a. Cold-rolled steel channels, not less than 0.0538”; 3/4" size; same finish as main runners.
   b. Hat shape, 7/8" deep, 0.0179”. AISI S220 and ASTM A653 G40 hot-dipped galvanized.
   c. 2-1/2" x 0.0296”, G40 galvanized steel studs. Provide for multiple

layer applications. Provide 12" long nested studs at suspension points.

3. Wire: Stainless steel 304 alloy for exterior conditions; galvanized soft annealed steel wire for interior conditions. Galvanized coating to meet or exceed ASTM A 641.
   a. Tie Wire: Minimum 16-gage.
   b. Hanger Wire: Minimum 8-gage.

B. Optional Framing: At contractor's option, proprietary furring system may be used in lieu of black iron system for dry interior conditions.

1. Description: Direct hung system consisting of interlocking main beams and cross-furring members and hanger wires, designed and manufactured specifically for suspending gypsum board ceiling.
   a. ASTM C645.
   b. Electrogalvanized, cold-rolled steel, 0.020" thick.
   c. Double web members; 1-1/2" high with 1-3/8" capped face.
2. Manufacturer: 640 System by CHICAGO METALLIC CORP.; Drywall Suspension System by USG, WORTHINGTON STEEL COMPANY, Watercheck CONTINENTAL BUILDING PRODUCTS, Furring Systems/Drywall by ARMSTRONG.
3. Reference: ASTM C635, heavy duty.

2.04 METAL FURRING

A. Material

1. Steel Sheet Components: Comply with AISI S220 requirements for metal, unless otherwise indicated.
2. Protective Coating: Coating with equivalent corrosion resistance of ASTM A653, G40, hot-dip galvanized, unless otherwise indicated.

B. Rigid Furring Channels: Hat-shaped; minimum 0.022 inch uncoated metal thickness; 7/8” deep, unless otherwise indicated.

C. Resilient Furring Channels: Minimum 0.0188” uncoated metal thickness; ½” deep; asymmetrical or hat-shaped members designed to reduce sound transmission.

D. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8” deep, minimum uncoated metal thickness of 0.018”, and depth required to fit insulation thickness indicated.

2.05 INTERIOR GYPSUM BOARD

A. General: Comply with ASTM C1396.

B. Fire Rated Gypsum Wallboard: Type “C” or "X" (special fire retardant) to meet fire ratings for construction shown. Tapered edges. Thickness 5/8" unless otherwise

indicated. Use at all locations indicated as meeting a specific fire resistance rating.

1. Provide 5/8", Type X board at all locations not indicated to receive a specific type board.

C. Moisture and Mold Resistant Gypsum Wallboard

1. ASTM C1396 (Section 5), Type X.
2. Edges: Tapered.
3. Thickness: 5/8 inch, unless otherwise indicated.
4. Acceptable products: Mold Tough and Mold Tough Firecode (Type X) by USG; XP and XP Fire-Shield by NATIONAL; ToughRock and ToughRock Type X by GEORGIA-PACIFIC; Mold Defense and Mold Defense Type X by CONTINENTAL BUILDING PRODUCTS or equal by other gypsum board manufacturers listed in 2.01A.
5. Water Absorption: ASTM C473, the average water absorption for panels is not greater than 5 percent by weight after two-hour immersion.
6. Resistance to Mold Growth: ASTM D3273, "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber," the panel score was 10.
7. Use on non-ceramic tiled walls, ceilings and soffits in toilet rooms, shower rooms and drying rooms; on ceramic tiled non-wet walls in toilet rooms; walls and partitions above ceilings. Maintain ratings where wall is required to be rated.

2.06 ACCESSORIES

A. Fasteners: Drywall screws and metal framing screws per manufacturer's instructions and recommendations for type and size, based on construction and conditions involved.

1. Steel Drill Screws: ASTM C1002.
2. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick specified in Section 05 40 00.

B. Trim: ASTM C1047.

1. Manufacturers
   a. Metal: BEADEX MANUFACTURING; CLARK DIETRICH BUILDING SYSTEMS; listed gypsum board manufacturers
   b. Vinyl: VINYL TECH; VINYL CORP.; TRIM TEX
2. Corner Beads - Outside, Square Corners: 1-1/4 inch x 1-1/4 inch heavy gauge galvanized steel or vinyl, perforated.
3. Corner Beads - Outside, Non-square Corners: BEADEX B-1 Splay Flexible Corner or equal. Concealed metal; two galvanized continuous strips laminated with paper trim; for application without mechanical fasteners.
4. Curved Edge Cornerbead: Notched or flexible edge.
5. Exposed Edges (Casing Beads): L-bead or LC-bead; exposed long flange receives joint compound. Size to suit wallboard. J-shaped bead that does not receive joint compound is not permitted.

6. Expansion (Control) Joints: Tape protected 1/4" wide x nominal 7/16" deep control slot.

C. Interior Joint Treatment Materials: ASTM C475.

1. Joint Tape. Width to adequately cover joint.
   a. Interior Gypsum Board: Paper.
   b. Exterior Gypsum Soffit Board: Paper.
   c. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
2. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   a. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
   b. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
      1) Use setting-type compound for installing paper-faced metal trim accessories.
   c. Fill Coat: For second coat, use setting-type, sandable topping compound.
   d. Finish Coat: For third coat, use setting-type, sandable topping compound.
   e. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.
3. Joint Compound for Tile Backing Panels:
   a. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.
   b. Cementitious Backer Units: Section 09 30 00.

D. Additional Item: All additional accessories to complete work including nails and anchors to secure frames to walls and floors.

E. Acoustic Materials

1. Insulation
   a. Type: Semi-rigid mineral fiber (glass fiber, slag wool or rock wool) blankets. Conform to ASTM C665, Type I, unfaced .
   b. Thickness: 3 inch, unless otherwise indicated.
   c. Manufacturer: Thermafiber by U.S. GYPSUM; JOHNS MANVILLE; OWENS-CORNING FIBERGLAS; CERTAINTEED.
2. Sealant: Nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
   a. Manufacturers
      1) USG Acoustical Sealant
      2) TREMCO Acoustical Sealant

3) PECORA BA-98
4) BASF MasterSeal NP 520

3. Neoprene impregnated sealant tape.
4. Head of Wall Insulation: Pre-manufactured, high-density mineral fiber acoustical insulation shaped to fit the trapezoidal flutes, typical of metal decking and complying with ASTM E119 as safing insulation.

F. Adjustable Aluminum Mullion Closures. GORDON Mullion Mate Series 40 or equal by MULL-IT-OVER. Assembly STC to be 56 minimum. Provide end cap and sealant for complete assembly.

G. Extruded Corner Trim

1. Material: Extruded aluminum 1 ¼" legs with 7/8" joint receptor.
2. Basis of Design: FRY REGLET DMCT-375
3. Other Manufacturers: Equal products by PITTCON or GORDON

PART 3 EXECUTION

3.01 PREPARATION

A. Provide adequate lighting and ventilation during installation and joint finishing treatment.

3.02 INSPECTION

A. Examine substrates and installation conditions. Do not proceed with gypsum wallboard work until unsatisfactory conditions have been corrected.

1. Protrusions of framing, twisted framing members, or unaligned members must be repaired before installation of wallboard is started.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.03 FRAMING INSTALLATION

A. Comply with the requirements of ASTM C754 "Installation of Steel Framing Members to Receive Screw Attached Gypsum", and as specified.

B. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

2. Securely attach runner to floor with expansion anchors or other approved means.

C. Install all framing plumb and square with spacing as indicated.

D. Provide 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 recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Company's "Gypsum Construction Handbook".

E. Bridging

1. Up to 10 ft. Wall Height: 1 row.
2. 10 ft. and Over Wall Height: 2 rows of bridging.

F. Provide a minimum of two (2) screws per connection.

3.04 GYPSUM BOARD INSTALLATION

A. Gypsum Board Systems: Comply with ASTM C840.

B. General

1. Pre-installation Conference: Before start of gypsum board installation, meet at the project site with the Architect and installers of related work, including work requiring openings, chases, frames, access panels, support, similar integrated requirements and mechanical and electrical trades. Review potential interferences and conflicts and coordinate layout and sequencing requirements for proper installation and integration of the work.
   a. Do not proceed with gypsum board installation until blocking, framing, bracing and other supports for subsequently applied work have been installed, reviewed and accepted by the Architect.
   b. Do not install gypsum board until work concealed by gypsum board has been installed.

C. Application

1. Install gypsum board face side out. Do not install imperfect, damaged or damp boards.
2. Butt boards together for a light contact at edges and ends with not more than 1/16" open space between boards. Do not force into place.
3. Locate either edges or end joints over supports. Position boards so that both tapered edge joints abut. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
4. Attach gypsum board to framing and blocking as required for additional support at openings and cutouts.

5. Floating Construction: Install gypsum board with "floating" internal corner construction, unless isolation of the intersecting board is indicated.
6. In addition to compliance with the standards, comply with specific requirements indicated for each type of arrangement of gypsum wallboard system shown. Space fasteners in accordance with manufacturer's recommendations and complying with referenced standards.
    a. Walls and Partitions: Apply sheets horizontally or vertically. Provide maximum sheet lengths to minimize end joints with edges or ends over supports. In two layer applications, stagger joints of second layer from joints of first layer.
    b. Cut and install panels to eliminate vertical joints in corners of door frames to ceiling.
    c. Make cutouts to fit within wall plate, register and grille flanged. All cutouts made by knife or saw.
    d. Make angles and corners clean, true, plumb and square; walls plumb, flat and straight and ceilings flat and level.
    e. Ceilings: Apply gypsum board on ceilings, before application on walls and partitions. Install in direction and manner to minimize end joints. Stagger end joints over supports. In two layer applications, stagger joints of second layer from joints of first layer.

3.05 INSTALLATION OF SOUND RATED PARTITIONS

A. Provide sound-rated construction where indicated.

B. Acoustic Insulation: Install single layer of acoustic batt insulation in designated partitions after one side of gypsum board is installed, filling width and height of partition completely. Attach to gypsum board with adhesive spots to prevent subsequent displacement.

C. Extend partition stud system through acoustical ceilings to substrate. Apply gypsum board base panels full height, both sides of partition.

D. Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

E. Seal partition perimeters. Provide continuous beads of acoustical sealant at juncture of both faces of runners or plates with floor and ceiling construction and wherever work abuts dissimilar materials. Seal prior to installation of sound attenuation insulation and gypsum board panels.

F. Provide continuous beads of sealant at juncture of gypsum board and abutting surface. Install gypsum board with 1/8" relief for sealant. Sealants to be contained within depth of gypsum board, not as a fillet.

G. At openings and cutouts, fill open spaces between edges of gypsum board and fixtures, cabinets, ducts, and other flush or penetrating items, with continuous bead of acoustical sealant.

H. If sound-rated partitions intersect non-sound-rated partitions, extend sound construction to completely close-off sound flanking paths through non-rated construction. Seal joints between face layers at vertical interior angles of intersecting partitions.

I. Exercise particular care at walls surrounding toilet areas and walls and ceilings surrounding mechanical spaces to provide properly constructed sound-rated gypsum board partition and ceiling systems.

J. Verify that electrical boxes are not located back-to-back; back-to back boxes to be offset at least one stud space. Do not close off non-complying conditions before notifying and receiving direction from Architect.

3.06 TRIM AND ACCESSORIES

A. Install corner beads at external corners of gypsum wallboard and sheathing work. Use longest practical lengths.

B. Install edge trim wherever edge of gypsum board or sheathing would be exposed or semi-exposed.

1. Provide beaded trim to receive joint compound at all gypsum wallboard work.
2. Provide L-type trim where work is abutted to other work and Kerf-type where work is kerfed to receive kerf leg.
3. Provide U-type trim where edge is exposed, revealed, gasketed or sealant filled, including expansion joints.

C. Attach to framing with steel drill screws. Clinch attachment to wallboard not acceptable.

D. Control Joints

1. Install control joints to isolate gypsum board surfaces as recommended by ASTM C840. Verify locations with Architect prior to installation. Generally locate joints as follows when:
   a. Partition, furring or column fireproofing abuts a structural element (except floor) or dissimilar wall or ceiling.
   b. Ceiling abuts a structural element, dissimilar wall or partition or other vertical penetration.
   c. Construction changes within the plane of the partition or ceiling.
   d. Partition or furring run exceeds 30'.
   e. Ceiling dimensions exceed 50' in either direction with perimeter relief; 30' without relief.
   f. Exterior ceilings and soffits exceed 20' in either direction; align with

window mullions, when applicable.

g. Wings of "L", "U", and "T"-shaped ceiling areas are joined.

h. Expansion or control joints occur in the base exterior wall.

i. Differential Deflection Conditions: All locations where partitions are supported by two or more structural members and subject to differential deflection by live or dead loading:

1) Typical Framing Floor to Structure: Provide "Ceiling Deflection Track".

2) Framing over One Floor (stairs, shafts, etc.): Provide control joints where studs are interrupted by structure.

j. Partition terminations at window mullions.

1) Where indicated provide adjustable aluminum mullion closures specified in Part 2.

2) Where not indicated to receive mullion enclosures: Neoprene joint tape and caulking installed under Section 07 92 00. Provide break metal closure at partition end.

2. Provide framing immediately on both sides of joint and back with 2"+/- gypsum board strips as required to maintain fire resistance rating.

3.07 FINISHING

A. Comply with manufacturer's instructions for mixing, handling and application of materials. Apply treatment at joints both directions, at flanges of trim accessories, penetrations of gypsum board (electrical boxes, piping and similar work), fastener heads, surface defects and elsewhere indicated. Apply in manner that will result in each of these items being concealed when applied decoration has been completed.

B. Prefill open joints of more than 1/16" with special chemical-hardening type bedding compound, before bedding joint tape.

C. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.

D. Do not use topping compound for bedding joint tape.

E. Apply joint compound for the final coat of joint treatment, unless specifically recommended by the manufacturer for that use.

F. Walls Above Acoustical Ceiling Systems: Tape and fill joints with two coats of joint compound, sanding not required.

G. Leave all exposed surfaces smooth and even, ready for painting.

H. Provide where indicated on the drawings levels of finish as specified in ASTM C840, "Recommended Specification on Levels of Gypsum Board Finish". Levels of finish consist of:

1. Level 1 - **Areas Above Ceilings**: All joints and interior angles shall have

tape embedded in joint compound. Provide surface free of excess joint compound. Tool marks and ridges are acceptable.

2. Level 2 – **As a Substrate for Ceramic Tile**: All joints and interior angles to have tape embedded in joint compound and one separate coat of joint compound applied over all joints, angles, fastener heads, and accessories. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.
3. Level 4 – **All Areas Not Indicated to Receive Levels 1, 2 or 5**: All joints and interior angles to have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. All joint compound shall be smooth and free of tool marks and ridges.
4. Level 5 – **All Areas to Receive Semi-Gloss or Gloss Coatings**: All joints and interior angles to have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. A thin skim coat of joint compound, or a material manufactured especially for this purpose, shall be applied to the entire surface. Excess material is to be removed leaving a film covering over the gypsum board paper surface.

3.08 ADJUST AND CLEAN

A. Remove any screw which does not engage into a framing member or spins freely.

B. When paper face is punctured, drive new screw approximately 1-1/2" from defective fastener and remove defective fastener. Fill damaged surface with compound.

C. Ridging

1. Do not repair ridging until condition has fully developed: approximately 6 months after installation or one heating season.
2. Sand ridges to reinforcing tape without cutting through tape.
3. Fill concave areas on both sides of ridge with topping compound.
4. After fill is dry, blend in topping compound over repaired area.

D. Fill cracks with compound and finish smooth and flush.

E. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.09 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

END OF SECTION

SECTION 09 30 00

TILE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Extent of tile work is shown on drawings and schedules, and as specified herein.

B. Types of tile work required including the following:

1. Porcelain wall tile, floor tile and base.
2. Backer board.

C. Section also includes:

1. Crack-suppression membrane for thin-set tile installations.
2. Metal edge/transition strips installed as part of tile installations.
3. Shower basin installation and coordination with waterproofing.

1.02 RELATED SECTIONS

A. Sealant: Section 07 92 00.

1.03 QUALITY ASSURANCE

A. Manufacturer: Provide tile of each type produced by a single manufacturer. Provide materials obtained from one source for each type and color of tile, grout, and setting materials.

B. Installer: A firm with not less than 5 years experience in installing tile in applications similar to those required for this work.

C. Ceramic Tile Manufacturing Standard: TCA 137.1. Furnish tile complying with Standard Grade requirements unless indicated otherwise.

D. Proprietary Materials: Handle, store, mix and apply proprietary setting and grouting materials in compliance with manufacturer's instructions.

E. Installer to verify locations of all flexible joints required by the provisions of this section, by the recommendations of TCA, and by the recommendations of the related manufacturers. See Article 3.06.

1. Joint locations may or may not be indicated on the drawings.

F. ANSI Standards for Tile Installation Materials: Provide materials complying with

ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

1.04 PERFORMANCE REQUIREMENTS

A. Dynamic Coefficient of Friction: For tile installed on walkway surfaces subject to traffic while wet, provide products with a dynamic coefficient of friction not less than 0.42 as determined by testing identical products per ANSI A137.1. and A326.3 in each appropriate category.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's technical information and installation instructions for materials required. Include certifications and other data to show compliance with these specifications.

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: Submit manufacturer's color charts consisting of actual tiles or sections of tiles showing full range of colors available, for each type of tile specified. Include samples of grout and accessories requiring color selection. Submit full size sample for each type of trim, accessory and color. Submit samples of metal edge strip.

D. Certification: Furnish Master Grade Certificate for each type of tile, signed by manufacturer and Installer.

1.06 PRODUCT HANDLING

A. Deliver packaged materials and store in original containers with seals unbroken and labels intact until time of use, in accordance with manufacturer's instructions.

1.07 JOB CONDITIONS

A. Maintain environmental conditions and protect work during and after installation in accordance with referenced standards and manufacturer's printed recommendations.

PART 2 PRODUCTS

2.01 PORCELAIN TILE

A. Ceramic Wall Tile, Floor Tile and Base: Standard grade, impervious porcelain ceramic tile conforming to ANSI 137.1. Provide trim pieces as required.

B. Manufacturer

1. Basis of Design: As indicated.
2. Other Acceptable Manufacturers: Tile manufactured by the other companies are acceptable providing they meet the requirements specified herein and the colors are an acceptable match as determined by the Architect.

2.03 MORTAR, GROUT AND ACCESSORIES

A. Source: Setting mortar and grout to be from same manufacturer.

1. Adhesives, Epoxies, Mortar and Grout Manufacturers: CUSTOM BUILDING PRODUCTS, BOSTIK, MAPEI, LATICRETE, BOSTIC, TEC (H.B. FULLER) and BONSAL AMERICAN.
   a. Manufacturer's listed under the following applications are for basis of design. Equal products by above listed manufacturers are acceptable.

B. General - All Adhesives, Epoxies, Mortar and Grout: See Tile Installation Systems in Part 3 of this Section.

C. Modified Dry Set Cement Mortar - Thin Set: Factory mixed mortar of Portland cement/sand, field gauged with undiluted latex admixture. Conform to ANSI A118.4, Latex-Portland Cement Mortar. Provide type suitable for “medium-set” for tiles with a dimension larger than 15”.

1. Provide one of the following:
   a. BOSTIK, Durabond D-50 or D-60.
   b. MAPEI, Keraflex Super.
   c. CUSTOM BUILDING PRODUCTS, ProLite Tile and Stone Mortar
   d. LATICRETE, 255 MultiMax.
2. Thinset Mortar for Glass Tile: Complies with ANSI A118.4 and A118.11.
   a. BOSTIC Glass-Mate Glass Tile Mortar with Admixture Product 425TM Multi-Purpose Acrylic Latex Admixture.
   b. CUSTOM BUILDING PRODUCTS, VersaBond Professional Thin Set Mortar
   c. MAPEI: Adisilex P10 Mosaic & Glass Tile mixed with Keraply Latex additive
   d. Equal by LATICRETE

D. Dry-Set Mortar - Thin Set: Mixture of Portland cement with sand and latex, water imparting additive. Conform to ANSI A118.1, Standard Dry-Set Cement Mortar.

1. May be used in lieu of Modified Dry Set Cement Mortar for ceramic floor and wall tile.

E. Grout - Ceramic Tile (ANSI A118.7): Integrally colored, sanded (unless otherwise indicated), polymer modified cement type, factory prepared (premixed) grout. Color as selected by Architect.

1. Provide one of the following:
    a. BOSTIC, Ceramic Tile Grout with BOSTIK 425 Acrylic-Latex Admixture.
    b. TEC (H.B. FULLER), TEC Power Grout.
    c. MAPEI, Ultracolor Plus FA.
    d. LATICRETE, Permacolor Grout.
    e. CUSTOM BUILDING PRODUCTS, Prism
2. Colors: As selected by Architect.
3. Provide unsanded grout for glass tile and tile joints less than 1/8” wide.

F. Crack Isolation (Anti-Fracture) Membrane: Fabric-Reinforced, Modified-Bituminous Sheet: Self-adhering, modified-bituminous sheet with fabric reinforcement facing; 0.040-inch nominal thickness. ANSI A118.12.

1. Products: Provide one of the following:
    a. MAPEI CORPORATION; Mapeguard CI with Primer HM.
    b. NATIONAL APPLIED CONSTRUCTION PRODUCTS, INC.; Strataflex.
    c. POLYGUARD; Tileguard.
    d. CUSTOM BUILDING PRODUCTS, Crack Buster Pro.

G. Metal Edge Trim: L-shape, height to match tile and setting-bed thickness; stainless steel, ASTM A666, 300 Series. SCHLUTER, CERAMIC TOOL COMPANY, BLANKE

H. Grout Sealer: Low VOC, penetrating type as recommended by grout manufacturer that does not change color or appearance of grout.

J. Portland Cement Setting Mortar - Thick Set (ANSI 108.2): Provide waterproof membrane beneath floor setting beds. Provide cleavage membrane at floors without waterproofing membrane. Reinforce floor setting beds. Provide bed of a thickness as required to bring the tile to the required finish elevation as shown on the drawings. Provide materials as follows:

1. Underbed: Mix 1 part Portland cement to 5 parts loose, damp sand by volume.
    a. Portland Cement: ASTM C150 Type 1.
    b. Sand: ASTM C144.
    c. Water: Clean, potable and free of deleterious substances.
2. Membrane Waterproofing: See Membrane Waterproofing herein
3. Cleavage Membrane: ASTM D226; 15 pound non-perforated asphalt felt.
4. Underbed Reinforcement: ASTM A185, 2" x 2" x 16 gage, galvanized welded wire fabric.
5. Bond Coat: Portland cement paste on a plastic bed.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine surfaces to receive tile, setting beds and accessories before tile installation for the following:

1. Defects or conditions adversely affecting quality and execution of the installation.
2. Deviations beyond allowable tolerances of surfaces to receive tile.
3. Do not proceed with installation work until unsatisfactory conditions are corrected.

B. Conditions of surfaces to receive tile.

1. Surfaces to be firm, dry, clean, and free of oily or waxy films or curing compounds.
2. Grounds, anchors, plugs, hangers, bucks, electrical, plumbing and HVAC work in or behind tile to be installed prior to proceeding with tile work.

3.02 PREPARATION

A. Prepare surfaces to receive tile as required to achieve proper bond and as recommended by the Tile Council of America.

1. See Section 01 73 00 for additional floor preparation requirements.

B. Fill cracks, low areas and pits in concrete with self-leveling fill of type recommended by tile manufacturer for substrate conditions encountered.

C. Lightly grind concrete subfloors with a terrazzo grinder to remove trowel marks, slab curl at saw cut joints or other surface irregularities or high spots which will telegraph to the flooring surface.

D. Sawcut or grind transition areas to install tile flush with adjacent finished floor materials.

E. Clean surfaces in a manner suitable for proper installation. Verify that slabs are free of curing membranes, oil, grease, wax, dust and other materials deleterious to tile installation.

F. Primers or other preparations required or recommended in accordance with manufacturer's instructions.

3.03 INTERIOR WALL TILE INSTALLATION - SYSTEMS

A. Prepare surfaces, fit, set or bond, grout, and clean in accordance with Tile Council of America, "Handbook for Ceramic Tile Installation", 2019 Edition; and as follows:

C. Thin Set - Stud Walls - Over Tile Backerboard: TCA W244, dry-set mortar bond coat or latex Portland cement bond coat and grout.

1. Tile: ANSI A108.5.
2. Grout: ANSI A108.10.
3. Backerboard
    a. Joint Preparation: Fill joints completely with setting mortar and embed 2 inch wide coated fiberglass tape into skim coat of same mortar.
    b. Apply setting mortar in one layer, troweling skim coat with trowel's flat edge and then texturing with appropriate notched trowel. Troweling equipment must be appropriate for type of tile work and in good condition.

D. Thin Set - Stud Walls - Over Gypsum Board: TCA W243, dry-set mortar bond coat or latex Portland cement bond coat and grout.

1. Tile: ANSI A108.5.
2. Grout: ANSI A108.10.

D. Thin Set - Solid Back-Up Walls (concrete, CMU, etc.): TCA W202, dry-set mortar bond coat or latex Portland cement bond coat and grout.

1. Tile: ANSI A108.5.
2. Grout: ANSI A108.10.

3.04 INTERIOR FLOOR TILE INSTALLATION - SYSTEMS

A. Prepare surfaces, fit, set or bond, grout, and clean in accordance with Tile Council of America, "Handbook for Ceramic Tile Installation", 2019 Edition; and as follows:

B. Thin Set: TCA design F113, latex Portland cement mortar and grout or dry-set mortar and grout.

1. Tile: ANSI A108.5.
2. Grout: ANSI A108.10.

C. Thin Set, Adhesive: TCA F116; organic adhesive and grout.

1. Tile: ANSI A108.4.
2. Grout: ANSI A108.10.

D. Thick Set with Waterproof Membrane: TCA design F121; waterproof membrane, Portland cement mortar bed, reinforcing, bond coat and grout.

1. Tile: ANSI A108.1A.
2. Grout: ANSI A108.10.
3. Mortar Bed Thickness: As indicated (min. 1-1/4”; max. 2”).
4. Wet areas; shower areas; drying areas; other areas indicated

3.05 TILE INSTALLATION - PROCEDURES

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:

B. All tiles are to be subjected to thermal cycling prior too installation.

C. Extend tile work into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as otherwise shown. 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 that plates, collars or covers overlap tile.

E. Placement Methods: Install tile using the hereinbefore specified setting beds and grouts.

F. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are same size. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting.

1. Avoid tile layout with less than half width tiles at room/area perimeters, unless otherwise indicated on the floor layout drawings. Notify Construction Manager if layout not achievable per layout indicated on the drawings. Do not continue in room/area in question until approved by the Associate.
2. Provide uniform joint widths, unless otherwise shown.
    a. Ceramic Mosaic Tile: 1/16 inch.
    b. Quarry Tile: 1/4 inch
    c. Large format Floor Tile: 1/8 inch.
    d. Glazed Wall Tile: 1/16 inch.
3. Multiple Tile Face Size: Where indicated tile pattern contains multiple tile face sizes, coordinate with Architect to provide uniform joint with size.

G. Anti-Fracture Membrane: Install over floor cracks, cold-joints and sawed joints. Discontinue at expansion joints. Install in compliance with ANSI 108.17 and manufacturer’s instructions and recommendations. Seam joints as recommended by manufacturer. Conform to TCA F125. Coordinate with flexible joints specified in Article 3.07, Flexible Joints.

3.07 FLEXIBLE JOINTS

A. Locate flexible joints (expansion, control and isolation joints) prior to tile installation. See Quality Assurance in Part 1 herein.

B. Provide flexible joints as specified herein, unless more stringent requirements are indicated on drawings. Provide as specified, regardless if not indicated on drawings.

C. Joint to be continuous from face of tile to bottom of setting bed or leveling bed. Reinforcing to be discontinued at joint. Install continuous joint filler material in joint from setting or leveling bed to a point below face of tile adequate for proper placement of backing rod and sealant.

D. Joint Design: TCA design EJ171 as applicable. See Section 07 92 00 for sealant. Provide at the following locations:

1. Horizontal Surfaces
    a. Directly over expansion joints.
    b. Over anti-fracture membrane which is applied over structural slab cold joints, construction joints and control joints.
    b. Where tile work abuts restraining surfaces such as perimeter walls, curbs, columns, pipes, etc.
    c. Floor areas exceeding 12 feet in any direction for exterior work and 24 feet in any direction for interior work.
    d. Other locations where indicated.
2. Vertical Surfaces
    a. Directly over joints in wall substrate including cold joints, construction joints, control joints and expansion joints.
    b. At changes in substrate material.
    c. Where tile work abuts restraining surfaces such as perimeter walls, curbs, columns, pipes, etc.
    d. Where indicated.

E. Curing: Cure tile floor, base, and wall installations in accordance with manufacturer's recommendations, TCA recommendations, and in accordance with ANSI requirements.

F. Metal Edge Strips: Provide metal edge strips at openings without thresholds, and where exposed edges of tile floors meet other materials.

1. Except as otherwise indicated, where trim is located across door openings, locate trim on the door side in line with the edge of the door stop, terminating at the rabbet.

3.07 REPAIR, CLEAN AND PROTECT

A. Repair, or remove and replace chipped, damaged or otherwise defective work to the satisfaction of the Architect.

B. Cleaning: Upon completion of placement and grouting, clean all tile surfaces so that they are free of foreign matter.

1. Use methods and materials as recommended by tile manufacturer.
2. Replace tiles that cannot be satisfactorily cleaned.

C. Grout Sealer: Apply silicone 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 from joints and from tile faces by wiping with soft cloth.

D. Protection: When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent damage and wear.

1. Prohibit foot and wheel traffic from using tiled floors for at least 3 days after grouting is completed.
2. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide acoustical lay-in panel ceiling system as shown and specified. Work also includes:

1. Torsion spring panel system with perforated metal panels. Include:
   a. Backlighting system

1.02 RELATED SECTIONS

A. Gypsum Board Ceiling: Section 09 21 16.

1.03 QUALITY ASSURANCE

A. Workmanship: Comply with Ceilings & Interior Systems Contractors Association (CISCA) “Ceiling Systems Handbook”.

B. Installation: Performed by an experienced authorized installer approved by acoustical material manufacturer.

C. Fire Hazard Classification: Provide acoustical materials which have been UL tested, listed and labeled Class 0-25, when tested in accordance with ASTM E84, Class A flame spread rating in accordance with ASTM E1264 requirements.

D. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standards.

1. AIMA: Acoustical and Insulating Materials Association.
2. ASTM: American Society for Testing and Materials.
3. CISCA: Ceilings and Interior Systems Contractors Association.

E. Coordination Between Trades: Quality assurance includes the cooperation with HVAC, Plumbing and Electrical Contractors in regards to ceiling grid layout.

1. Procedures for submitting coordination drawings for ceiling work is included in Section 01 33 23 - Shop Drawings, Product Data and Samples.

1.04 SUBMITTALS

A. Product Data

1. Submit manufacturer's product data and installation instructions for each type of acoustical material and suspension system required.
2. Submit manufacturer's written instructions for recommended maintenance practices for each type of acoustical ceiling system required. Include recommendations for cleaning and refinishing acoustical units and precautions against materials and methods that may be detrimental to finishes and acoustical performances.

B. Samples: Submit 12" square acoustical panel samples for each type of acoustical unit required. Provide 12" long suspension system and edge molding samples.

C. Certification: Submit manufacturer's certification of acoustical units fire hazard classification rating and performance requirements.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, unopened protective packaging, with manufacturer's labels indicating brand name, pattern size, thickness and fire rating as applicable, legible and intact.

B. Store materials in original protective packaging to prevent soiling, physical damage or wetting.

C. Store cartons open at each end to stabilize moisture content and temperature.

D. Do not begin installation until sufficient materials to complete a room are received.

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 EXTRA MATERIALS

A. Maintenance Stock: Under this Section furnish to the Owner prior to final acceptance, extra maintenance stock of acoustical materials, consisting of a minimum of one percent of area of each size, type, thickness installed on the job, and 4% if the area is under 5,000 sq. ft. This extra stock is for the Owner's use after completion of the Project and is not to be used for repair or replacement required during the construction period. Properly package, seal, and identify extra stock material.

PART 2 PRODUCTS

2.01 SUSPENSION SYSTEM

A. Exposed "Tee" Grid System

1. Description: Cold-rolled electrogalvanized steel, factory applied white finish paint to match ceiling tile.
   a. Width of exposed face to match existing; ARMSTRONG Prelude and Prelude XL.

2. Description: Comply with ASTM C635. Provide systems adequate to support light fixtures, ceiling diffusers, and other normal accessories. Maximum deflection 1/360 of the span. All components of system from one manufacturer, die cut, and interlocking.
   a. Structural Class: Intermediate duty.
   b. Type of System: Direct Hung.
   c. Attachment Devices: Size for five times design load indicated in ASTM C635, Table 1 direct hung.
   d. Hanger Wires: ASTM A641 galvanized carbon steel, soft temper, prestretched not less than 12 gauge.
   e. Carrying Channels: 1-1/2" steel channels, hot-rolled or cold-rolled, not less than 0.475 lbs per linear foot, standard finish.
   f. Members: Provide manufacturer's standard exposed runners, cross runners and accessories of type and profiles indicated, with exposed cross runners coped to lay flush with main runners.

3. Edge Moldings: Hemmed edge wall angles, cold-rolled electrogalvanized steel, factory applied finish to match grid system. Provide width, configuration and profile indicated.

2.02 ACOUSTICAL UNITS

A. General

1. Cellulose Base
   a. Toxicity/IEQ: Panel based anti-microbial treatment to inhibit growth of mold and mildew:
      1) Coating-Based Antimicrobial Treatment: Provide acoustical panels with face and back surfaces coated with antimicrobial treatment; and showing no mold or mildew growth when tested in accordance with ASTM D3273.
      2) Panel-Based Antimicrobial Treatment: Provide acoustical panels manufactured with antimicrobial treatment in the panels.
2. Mineral Base
   a. Toxicity/IEQ: Panel based anti-microbial treatment to inhibit growth of mold and mildew:
      1) Coating-Based Antimicrobial Treatment: Provide acoustical panels with face and back surfaces coated with antimicrobial treatment; and showing no mold or mildew growth when tested in accordance with ASTM D3273.
      2) Panel-Based Antimicrobial Treatment: Provide acoustical panels manufactured with antimicrobial treatment in the

panels.

B. Acceptable Manufacturers: The products indicated are by ARMSTRONG.

C. Type A1: Match existing, 24” x 24” x 1”, beveled tegular edge, NRC .85, CAC 35, light reflectance LR-.90, with white, washable finish; 15/16” grid.

D. Type A2: Ultima #1912, 24” x 24” x 3/4”, beveled tegular edge, NRC .70, CAC 35, light reflectance LR-.90, with white, washable finish; 9/16” grid.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates, structure and installation conditions. Do not proceed with acoustical ceiling systems work until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling.

1. Avoid use of less than quarter widths units at borders.

B. Coordinate with ceiling layout on drawings.

C. Notify Architect of discrepancies between ceiling layout on drawings and ceiling layout proposed. Do not proceed until approved by Architect.

3.03 INSTALLATION

A. Suspension System: Comply with ASTM C636 requirements and be water or laser leveled, maximum deflection of 1/360 of span and maximum surface leveling tolerance 1/8" in 12'-0".

B. Rough Suspension

1. Hangers: Ceiling suspension systems shall not be supported from ductwork, electrical conduit, heating or plumbing lines or any other utility lines. Each utility and the ceiling suspension system shall be a separate installation and each shall be independently supported from the building structure. Where interferences occur, employ trapeze hangers or supports to avoid interferences with appurtenances requiring servicing. Support all four corners of suspension systems at fluorescent light fixtures.
2. Wall Molding

a. Provide edge trim molding at perimeter of acoustical ceiling installation and intermediate vertical surfaces. Use maximum lengths. Miter trim corners to provide tight, accurate joint. Connect moldings securely to substrate surfaces.
b. Connect moldings to substrate at intervals not over 16" on center and not more than 3" from ends, leveling with ceiling suspension system to tolerance of 1/8" in 12'-0".

C. Acoustical Units

1. Install acoustical lay-in panels level, in uniform plane, with joints accurately cut to ensure a snug and square fit. All panel faces and edges to be free from damage or soiling.
   a. Fit border units accurately at borders and penetrations.
   b. Recreate tegular and decorative edges at wall cuts and other cuts.
   c. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and perimeter moldings.
   d. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
   e. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
   f. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
2. Coordinate suspension systems grid layout with electrical lighting fixture lay-out and installation.

3.04 CLEANING

A. After installation, clean soiled or discolored surfaces of acoustical units and exposed suspension members. Comply with manufacturer's recommendations for cleaning and touch-up of minor finish damage.

B. Adjust all sags and twists which develop in ceiling systems. Remove and replace units which are improperly installed and damaged units which cannot be successfully cleaned and repaired to eliminate evidence of damage.

END OF SECTION

SECTION 09 54 00.13

CEILING BAFFLES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide suspended ceiling baffle system consisting of baffles, suspension system and accessories for a complete installed system. Types include:

1. Polyester fiber type

1.02 RELATED SECTIONS

A. Acoustical Panel Ceilings: Section 09 51 13.

1.03 SUBMITTALS

A. Manufacturer's Data: Submit 2 copies of manufacturer's specifications and installation instructions for each component of the ceiling system. Include reports and other data as may be required to show compliance with these specifications.

B. Shop Drawings: Submit shop drawing details and reflected ceiling plans of ceiling system and all component parts. Show location of ceiling units and other items of work which are to be coordinated with the ceiling system.

C. Samples: Minimum 12” length x full width of baffle with specified finish.

D. Maintenance Instructions: Submit manufacturer's recommendations for removal, replacement and cleaning of each component system of the ceiling system. Include precautions against materials and methods that may be detrimental to finishes.

1.04 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials, fabrication, and installation.

1. Mockup to be minimum of four rows 6’-0” long of product.
2. Approved mockups may become part of the completed Work if undisturbed at time of final acceptance of the work.

1.05 JOB CONDITIONS

A. System Layout: Coordinate layout with other work which penetrates or is

supported by the ceiling system.

B. Installer shall consult other trades and Contractors involved prior to start of ceiling work, to determine areas of potential interference. Do not start installation until interference has been resolved to the satisfaction of the Installer.

PART 2 PRODUCTS

2.01 MODEL AND MANUFACTURER

A. Basis of Design: AUTEX ACOUSTICS Frontier acoustic Raft

1. Other Acceptable Manufacturers: Ceiling baffles manufactured by other manufacturers will be considered if materials meet the requirements of the Basis of Design and the type, sizes and colors are an acceptable match as approved by the Architect

2.02 CEILING PANEL MATERIALS

A. Material: 1/2" PET.

1. Beam 250: 94.5 x 9" x 3"
2 Acoustics:

125	250	500	1000	2000	4000	NRC
0.20	0.45	0.70	1.10	1.35	1.30	0.90

3. Fire Rating: UL Tested ASTM E-84: Class A

B. Module Spacing: As indicated.

C. Color: As indicated.

D. Installation: Manufacturers direct attachment system. Provide all accessories for attachment.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas receiving ceiling system for conditions that might adversely affect the installation.

B. Verify that all work above system has been satisfactorily completed prior to start of ceiling installations.

C. Do not start installations until all unsatisfactory conditions affecting ceiling systems have been corrected.

3.02 PREPARATION

A. Provide layouts for inserts, clips and other support items required to be installed by other trades. Furnish inserts, clips and related items to other trades in a timely manner to preclude construction delays.

B. Coordinate with other trades for proper installation of inserts and related items.

C. Verify layouts by actual field measurements.

1. Establish layout to balance borders and minimize out-of-square conditions.

3.03 INSTALLATION

A. Install system in accordance with manufacturer's printed installation instructions, submittals, applicable industry standards, and governing regulatory requirements for the work.

3.04 ADJUST AND CLEAN

A. Adjust components to provide uniform tolerances.

B. Replace all components that are scratched, dented or otherwise damaged.

C. Clean exposed surfaces with non-solvent, non-abrasive commercial type cleaner.

END OF SECTION

SECTION 09 54 29

LINEAL WOOD CEILINGS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Suspended lineal wood panel ceiling system, complete with wood veneer planks, felt strips, suspension system and all accessories and components for complete and secure installation.

1.02 RELATED SECTIONS

A. Acoustical Panel Ceilings: Section 09 51 13.

B. Sustainable Design Requirements: Section 01 81 13.

1.03 SUBMITTALS

A. Manufacturer's Data: Submit 2 copies of manufacturer's specifications and installation instructions for each component of the ceiling system. Include reports and other data as may be required to show compliance with these specifications.

B. Shop Drawings: Submit shop drawing details and reflected ceiling plans of ceiling system and all component parts. Show location of ceiling units and other items of work which are to be coordinated with the ceiling system and show framing and support details for work supported by the ceiling system.

C. Maintenance Instructions: Submit manufacturer's recommendations for removal, replacement and cleaning of each component system of the ceiling system. Include precautions against materials and methods that may be detrimental to finishes.

D. Samples: Samples of wood with specified veneer and finish.

E. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.

1. Ceiling Units: Furnish quantity of full-size units equal to 2.0 percent of amount installed.
2. Suspension System Components: Furnish quantity of each exposed suspension component equal to 1.0 percent of amount installed.

F. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.

F. Sustainable Design Documentation Submittals: Comply with Section 01 81 13.

1. VOC Limits: Include documentation verifying product Low Emitting Material Building Product Disclosures and Optimization.

1.04 QUALITY ASSURANCE

A. Fire Performance Characteristics: Identify ceiling components with appropriate applicable, testing, including:

1. Surface Burning Characteristics: As follows, tested per ASTM E84 and complying with Class A fire performance as follows:
   a. Flame Spread: 25 or less
   b. Smoke Developed: 50 or less

B. Woodworking Standards: Manufacturer must comply with specified provisions of Architectural Woodworking Institute quality standards.

C. Coordination of Work: Coordinate ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.05 JOB CONDITIONS

A. System Layout: Coordinate layout with other work which penetrates or is supported by the ceiling system.

B. Installer shall consult other trades and Contractors involved prior to start of ceiling work, to determine areas of potential interference. Do not start installation until interference has been resolved to the satisfaction of the Installer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver system components in manufacturer's original, unopened packages clearly labeled with the following information: item number and quantity, manufacturer's name and address, client name and address and site address.

B. Store components in a fully enclosed dry space where they will be protected against damage from moisture, direct sunlight, surface contamination and other construction activities.

C. Exercise care in handling components to prevent damage to the surfaces and edges and prevent distortion or other physical damage.

PART 2 PRODUCTS

2.01 LINEAL WOOD CEILING

A. Wood Veneer Planks

1. Type: Wood veneer laminated to wood. Return veneer on sides.
2. Surface Texture: Smooth
3. Composition: Class A fire-rated.
4. Finish: As indicated.
5. Species: As indicated, Grade A
6. Size: 4 1/2 inch X ¾ inch. Length as indicated
7. Reveal: 3/4 inch with black fleece strip.
8. Edge Banding and Trim: To match face veneer

B. Suspension System:

1. Components: All linear carriers: Commercial quality hot dipped galvanized steel as per ASTM A653. Linear carriers are double-web steel construction with 15/16 in type concealed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Linear carriers shall have rotary stitching.
   a. Structural Classification: ASTM C 635 Heavy Duty.
   b. Color: Black.
   c. Clips: Integral, factory-applied, spring steel clips on linear carriers; quantity as determined by system manufacturer.
2. Attachment Devices: Size for five times design load indicated in ASTM C635, Table 1, Direct Hung unless otherwise indicated.
3. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least time three design load, but not less than 12 gauge.
4. Accessories/Edge Moldings and Trim
   a. Wall Molding: Provide manufacturer's standard angle molding or shadow molding as indicated. Black.
   b. Side and alignment clips between planks.
5. NRC: 0.50.

C. Sound-Absorbent Fabric Layer: Provide fabric layer consisting of black, nonwoven, nonflammable, sound-absorbent material with surface-burning characteristics for flame-spread index of 25 or less and smoke-developed index of 50 or less, as determined by testing per ASTM E 84.

D. Provide miscellaneous materials and fasteners as required for a complete installation.

E. Basis of Design: ARMSTRONG - ARCHITECTURAL COMPONENTS GROUP, INC. Linear Open Series 2 wood ceiling system.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect the area where the ceiling system is to be installed for conditions that may affect the work and notify the Contractor in writing of any unsatisfactory conditions before proceeding.

B. Verify that all work above the ceiling system is complete prior to start of the ceiling installation.

C. All unsatisfactory conditions potentially affecting the ceiling system are to be corrected prior to the start of ceiling installation.

3.02 PREPARATION

A. Verify and confirm ceiling layouts by actual field measurements to balance borders and minimize out-of-square conditions. Coordinate all work that penetrates the ceiling.

B. Cutouts for lights, speakers, sprinklers or other items can be done on site.

3.03 INSTALLATION

A. Supply hangers for installation to the respective trade in ample time and with clear instructions for their correct placement. Provide additional hangers as required.

B. Install wood panel ceiling system in accordance with approved drawings and in accordance with manufacturer's recommendations.

C. Install ceiling system in a manner capable of supporting all superimposed loads.

1. Maximum Deflection Permitted: 1/360 of span
2. Maximum Surface Deviation: 1/8" in 10'
3. Planks: Installed true and plumb to within manufacturing tolerance of 1/8” within 8’ of length.

D. Install after major work is above ceiling complete.

E. Coordinate the location of hangers and braces with other work.

F. Layout of hangers and carrying channels shall be located to accommodate fittings and units of equipment that are to be placed after the installation of ceiling systems.

G. Spacing of Hangers: Where interrupted, reinforce the nearest adjacent hangers and related carrying channels as required to span the required distance.

H. Hang ceiling system independently of walls and columns.

I. Where carrying members are spliced, avoid visible displacements of longitudinal axis or face plane of adjacent members.

J. Fixtures

1. Do NOT support fixtures from or on main runners of cross runner if weight of the fixture causes the total dead load to exceed the deflection capability.
2. Support fixture loads by installing extra hangers within 6 inches of each corner, or support fixtures independently from structure above.
3. Do NOT install fixtures so that main runners and cross runners will be eccentrically loaded.
4. Where fixture installation would produce rotation of runners, provide stabilizer bars.

K. Complete work shall produce finished ceilings true to lines and levels, free from warped, soiled and damaged panels and components; complete with trim pieces.

3.04 ADJUST AND CLEAN

A. Adjust components to provide uniform tolerances.

B. Replace all panels that are scratched, dented or otherwise damaged.

C. Clean exposed surfaces as recommended by manufacturer.

END OF SECTION

SECTION 09 65 00

RESILIENT FLOORING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide resilient flooring as shown and specified. Work includes:

1. Luxury vinyl tile.
2. Base.
3. Adhesives and accessories to complete the work.

1.02 QUALITY ASSURANCE

A. Provide each type of resilient flooring and base material produced by one manufacturer, including recommended adhesives and leveling compounds.

B. Provide each type resilient flooring and base material from same production run. Colors shall be uniform throughout.

C. 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.

D. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard.

1. ASTM: American Society for Testing and Materials.
2. FS: Federal Specifications as established by the U.S. Government, General Services Administration.
3. U.L.: Underwriter's Laboratories.
4. ADA: Americans with Disabilities Act Accessibility Guidelines.

E. Slip Retardant Performance: Unless a greater performance is specified under a specific product, all floor materials must have a minimum static coefficient of friction of 0.6.

1.03 SUBMITTALS

A. Submit manufacturer's product data and installation instructions for each type of resilient flooring, base and accessory required.

B. Samples

1. Tiles: Submit full sized samples of each type, color and pattern required to

illustrate the full range of color variations.

2. Base: Provide 6" lengths of each type and color.

C. Shop Drawings: Show locations of each type and color of tile and tile pattern.

D. Submit manufacturer's certification that resilient flooring furnished complies with required fire test performance and has been tested and meets indicated requirements.

E. Submit manufacturer's written instructions for recommended maintenance practices for each type of resilient flooring, base and accessory material required.

F. Extra Stock: Furnish extra materials in the following quantities:

1. Tiles and Base: Furnish 2% of the total quantity (but not less than 2 full sealed cartons) of each type, pattern and color. Provide 5% of colors with less than 5000 square feet. Properly package and identify each material.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original, unopened labeled containers.

B. Store, protect, and handle resilient flooring materials in accordance with manufacturer's recommendations to prevent damage, soiling and deterioration.

C. Store materials in areas to receive resilient flooring for a minimum of 48 hours before installation.

1.05 PROJECT CONDITIONS

A. Maintain uniform room temperature range not less than 70 degrees F., in areas to receive resilient flooring for minimum 48 hours before installation and 48 hours after installation.

B. Provide adequate lighting and ventilation during installation and clean-up.

C. Protect adjoining surfaces from damage and soiling.

PART 2 PRODUCTS

2.01 RESILIENT FLOORING MATERIALS

A. Luxury Vinyl Strip and Tile Flooring

1. Type: Meets Reference Specification ASTM F1700, Type B, Class III
2. Thickness: 2.5 mm total with 28 mil urethane wearlayer.
3. Sizes: As indicated.
4. Properties:
   a. Static Load: ASTM F970 Meets Requirements

b. Indentation – Residual (75 Lbs): Meets Requirements
c. Coefficient Of Friction: ASTM D2047 0.65 (Dry)
d. Fire Rating: ASTM E648 Class I
e. Smoke Density ASTM E662: Meets Requirements

5. Colors, Patterns and Manufacturers
   a. Basis of Design: As indicated on the drawings.
   b. Other Acceptable Manufacturers: Luxury vinyl flooring manufactured by other manufacturers will be considered if materials meet the requirements of the Basis of Design and the sizes and colors are an acceptable match as approved by the Architect.

2.02 BASE

A. Vinyl Base: Complying with ASTM F1861, Type TV, Group 1, 4" high, 1/8" gage. Provide long length rolls and job formed corners. Standard top set cove (Style B) at resilient and other hard surface flooring and straight toeless (Style A) at all carpeted floors.

1. Colors and Manufacturers
   a. Basis of Design: As indicated on the drawings.
   b. Other Acceptable Manufacturers: Vinyl base manufactured by other manufacturers will be considered if materials meet the requirements of the Basis of Design and the colors are an acceptable match as approved by the Architect.

B. Rubber Base, Millwork Type: Thermoplastic rubber formulation designed specifically to meet the performance the performance and dimensional tolerance requirements of ASTM F1861, Type TP, Group 1 (solid) Standard Specification for Resilient Wall Base. Base shall contain a minimum of 90 percent recycled material.

1. Hardness - ASTMD 2240: 85 Shore A
2. Corners: Field miter cut.
3. Colors and Manufacturers
   a. Basis of Design: Colors and types indicated on the drawings are manufactured by JOHNSONITE/TARKETT.
   b. Other Acceptable Manufacturers: Products manufactured by VINYL PLASTIC, INC. (VPI) or ROPPE are acceptable providing they meet the requirements specified herein and are an acceptable color and style match as approved by the Architect. Color and style match should be submitted to the Architect during bidding for inclusion by an Addendum.

2.03 ACCESSORIES

A. Leveling Compound: Non-staining latex modified, Portland cement based type, compatible with flooring, as provided or recommended by the flooring manufacturer.

B. Adhesives: Water resistant, stabilized type as recommended by the resilient flooring and base manufacturer to suit material and substrate conditions.

C. Resilient Edge/Transition Strips: Provide rubber or stainless steel transition strips by the following manufacturers.

1. Resilient-to-Carpet: Rubber. Colors as selected by Architect.
   a. ROPPE, #56
   b. JOHNSONITE/TARKETT, CTA-XX-H
   c. VPI FLOORING, ACC12
2. Resilient-to-Concrete: Stainless steel
   a. SCHLUTER Reno U; stainless steel
   b. GREAT LAKES TILE PRODUCTS; Reducer.
   c. BLANKE CORP.; Reducer Trim.
3. Where transition types are required for conditions other than those listed above, provide rubber type from the manufacturers listed to create a smooth transition or termination.

D. Cleaning and Polishing Materials: Polish and neutral cleaner as recommended by the floor material manufacturer.

E. Existing Adhesive Remover: Non-toxic type; similar to De-Sol-It by ORANGE-SOL or equal by NAPIER ENVIRONMENTAL TECHNOLOGIES, INC., or CITRUS KING.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates and installation condition. Do not proceed with resilient flooring work until unsatisfactory conditions have been corrected.

B. Subfloor surfaces shall be smooth, level, at the required finish elevation, and within the tolerances specified in Section 03 30 00.

C. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 PREPARATION

A. Prepare substrates according to floor 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 floor tile manufacturer. Do not use solvents.

3. Perform tests recommended by flooring manufacturer. Proceed with installation only after satisfying manufacturer's recommendations for test results.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install flooring until it is the same temperature as the space where it is to be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by flooring.

3.03 INSTALLATION

A. Install resilient flooring and accessories with adhesive in strict compliance with the manufacturer's recommendations. Butt tightly to vertical surfaces, thresholds, nosings and edgings. Scribe around obstructions and to produce neat joints, laid tight, even and straight. Extend flooring into toe spaces, door reveals and into closets and similar openings.

B. Tile Flooring

1. Lay tile flooring with joints tight, in true alignment and parallel to walls of rooms and corridors.
2. Lay tile symmetrically about centerlines of space, without pattern or borders. Adjust layout to avoid use of cut widths less than one-half tile at room perimeter.
3. Match tile for color by using manufactured and packaged sequence.
4. Broken, cracked, or deformed tiles are not acceptable.
5. Immediately after installation, thoroughly roll tile with a 150 lb. sectional roller until a firm, uniform bond has been obtained.

C. Base

1. Install at walls, column, casework and other permanent fixtures as scheduled. Install in as long of lengths as practicable. Tightly bond base to backing throughout length of each piece, with continuous contact at horizontal and vertical surfaces.
2. Provide terminal base ends beveled and toes rounded.
3. On masonry surfaces or other similar irregular surface, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.

3.04 CLEANING AND PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. After flooring has set, clean thoroughly. Remove excess adhesive or other surface blemishes from flooring, using neutral type cleaners as recommended by the flooring manufacturer.

C. Perform initial maintenance according to latest edition of manufacturer's maintenance manual and the following:

D. Protect installed flooring from damage and staining with heavy duty non-staining Kraft paper or other covering at all traffic lanes. Protect completed work from traffic and damage until final acceptance.

END OF SECTION

SECTION 09 65 66

RESILIENT ATHLETIC FLOORING – TILES/SHEETS

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide rubber athletic flooring as indicated. Include all trim, accessories and adhesives for a complete installation.

1.02 RELATED SECTIONS

A. Concrete Tolerance: See Section 03 30 00.

1.03 QUALITY ASSURANCE

A. Installer Qualifications

1. Firm experienced in the flooring field and approved by the flooring manufacturer.
2. Must have completed a minimum of three projects of similar magnitude and complexity.

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.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product data that includes Physical Properties and installation instructions.

B. Color Selection Chart: Submit to Architect for selection. Submit actual sample of color material if so requested by Architect.

C. Samples

1. Tiles: Submit full sized samples of each type, color and pattern required to illustrate the full range of color variations.

2. Sheet Flooring: Manufacturer’s standard sample size, but not less than 9” x 9” of each type, color and pattern required to illustrate the full range of color variations.

D. Maintenance Literature: Submit three copies of manufacturer's recommended

maintenance instructions.

E. Extra Stock

1. Tiles: Furnish 2% of the total quantity (but not less than 2 full sealed cartons) of each type, pattern and color. Provide 5% of colors with less than 5000 square feet. Properly package and identify each material.
2. Sheet Flooring: Furnish 10 linear feet in roll form for each 500 linear feet or fraction thereof, of each product, color and pattern. Package each roll with protective covering and identification labels describing contents.

1.05 DELIVERY, STORAGE AND HANDLING

A. Do not deliver materials until masonry and painting work is completed and all overhead mechanical and electrical work is installed.

B. Maintain room temperatures at minimum 55 degrees F. in storage areas and during installation.

1.06 JOB CONDITIONS

A. Proper Surfaces

1. Even, sound, thoroughly clean and dry and free of all defects that might adversely affect the flooring work.
2. Floor tolerances are specified in Section 03 30 00.
3. All floors to receive resilient flooring shall be wet cured only. No curing compound permitted.

B. Related Work: Work which passes through, beneath or behind flooring must be completed prior to starting any flooring work.

C. Temperature Requirements

1. Temporary Heat: Provide as required to maintain the minimum temperature during flooring installation and for at least one week after installation.
2. Minimum Temperature: 70^{o} F for a minimum two weeks prior to and during application.
3. Humidity: Do not apply flooring when relative humidity exceeds 70% or to damp or wet surfaces.

D. Ventilation: Provide adequate ventilation to prevent accumulation of hazardous fumes during application of solvent-based products in enclosed spaces, and maintain until flooring and finish has cured.

PART 2 PRODUCTS

2.01 RUBBER SHEET FLOORING

A. Type: Multilayer vulcanized rubber

B. Manufacturer: Basis of Design: NORTHWEST RUBBER Reaction

C. Properties

1. Total Thickness 10mm
2. Hardness Shore A ASTM D2240 80 ± 5
3. Compression Set ASTM D395 0.0993
4. Coefficient of Friction ASTM D2047 dry > 0.8
5. Tensile Strength ASTM D412 Top >1000psi / Bot >350ps
6. Static Load Limit ASTM F970-00 Passes
7. Abrasion Resistance ASTM D-3389 Passes

D. Flammability – Critical Radiant Flux

1. Fire Resistance - ASTM E684 (Flooring) Class 1

E. Adhesive: Type as recommended by flooring manufacturer for concrete substrate.

2.02 ACCESSORIES

A. Concrete Slab Prime: Non-staining type, compatible with adhesive, as recommended by flooring manufacturer.

1. Moisture Emissions Sealer: Type specifically formulated for moisture emission control.

B. Leveling Compound: Non-staining latex modified, Portland cement based type, compatible with flooring, as provided or recommended by the flooring manufacturer.

C. Adhesives: Water resistant, stabilized type as recommended by the resilient flooring and base manufacturer to suit material and substrate conditions.

1. Low-VOC, FS MMM-A-125C, Type II, water- and mold-resistant. Use ASTM D3110, dry-use type for laminated and finger-jointed members, certified in accordance with ASTM C557.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrates and installation condition. Do not proceed with flooring work until unsatisfactory conditions have been corrected.

B. Subfloor surfaces shall be smooth, level, at the required finish elevation, and within the tolerances specified in Section 03 30 00.

C. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 SUBSTRATE PREPARATION

A. Prepare substrates according to floor manufacturer's written instructions to ensure adhesion of flooring products.

B. Concrete Substrates

1. Verify that substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Perform moisture and pH tests recommended by flooring manufacturer. Proceed with installation only after satisfying manufacturer’s recommendations for test results.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install flooring until it is the same temperature as the space where it is to be installed.

E. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 INSTALLATION

A. Install flooring in accordance with manufacturer's instructions and recommendations.

3.04 CLEANING AND PROTECTION

A. Protect resilient flooring from damage and wear during construction operations. Where temporary cover is required for this purpose, comply with manufacturer's recommendations for protective materials and the method of their application. Remove temporary covering just prior to cleaning for final inspection.

B. Clean flooring just prior to final inspections. Use materials and procedures recommended by flooring manufacturer.

END OF SECTION

SECTION 09 68 00

CARPETING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Carpet, installation and all adhesive, edge guards, and accessories necessary for the installation of:

1. Carpet tile
2. Walk off / entrance carpet

B. Work includes preparation of subsurfaces, cleaning, and protection of finished carpet.

1.02 QUALITY ASSURANCE

A. Installer: Firm with not less than 5 years of carpeting experience similar to work of this Section.

1. Work not in compliance with the manufacturer's recommended standards and procedures shall be promptly corrected at the Contractor's expense.

B. Manufacturer: Firm (carpet mill) with not less than 5 years of production experience with similar types specified in this section; and whose published product data clearly indicates compliance of product with requirements of this Section.

C. General Standard: "Carpet Specifiers Handbook" by The Carpet and Rug Institute; for definitions of terminology not otherwise defined herein, and for general recommendations and information.

D. Fire Performance Characteristics: Provide carpet that is identical to that tested for the following fire performance requirements, according to test method indicated, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

1. Flammability - ASTM D2859: Passing Methanine Pill Test.
2. Critical Radiant Flux - ASTM E648: Not less than 0.45 watts per square centimeter.
3. Smoke Density - ASTM E662: 450 or less.

4. Pile Height: Provide carpet that is ½" maximum as required by ADDAG 4.5.3.

1.03 REFERENCE STANDARDS

A. Carpet: Comply with the local building authority for flame spread and smoke contribution requirements and tested in accordance with ASTM E84.

1.04 SUBMITTALS

A. Samples

1. Tiles: Submit full size tiles (samples) of each color and pattern selected.
2. Broadloom: Submit 12" x 12" samples of each color and pattern selected.
3. Accessories: 12" long sample of each type exposed edge stripping and accessory item.

B. Product Data: Provide for all items. Include, product data covering carpet construction, physical characteristics, durability, resistance to fading, and flame resistance characteristics.

C. Shop Drawings

1. Tiles: Submit drawings showing layout. Indicate pile or pattern direction and locations and types of edge strips.

D. Certifications: Contractor shall provide the following:

1. Manufacturer: Before carpet materials are ordered, submit 4 copies of test results from a recognized laboratory and 4 copies of a notarized statement, signed by an officer of the manufacturer, confirming that the carpet products proposed for use are those which have passed the required tests indicated under "Performance Standards" for the carpet and comply with the requirements of State and local fire authorities.
2. Installer: Submit 4 copies attesting that materials actually installed were the same as those certified as meeting specified requirements.

1.06 PRODUCT DELIVERY AND STORAGE

A. Deliver carpeting materials in original mill protective wrapping, and store inside protected from weather, moisture and soiling.

B. Investigate and resolve access restrictions, including elevator capacity, entrances and accessibility, to assure proper delivery and installation of materials.

C. Protect materials against damage of any kind. Damaged products, including soiled fabrics, will be rejected.

1.07 MAINTENANCE

A. Manufacturers: Provide three (3) copies of maintenance schedules, describing programmed maintenance procedures, including general maintenance, preventative maintenance, spot removal, traffic lane maintenance and overall

cleaning.

B. Operational Service: Provide manufacturer's take-back program service for carpet installed in project. Service shall reclaim materials for recycling and/or reuse. Service shall not landfill or burn reclaimed materials.

1.08 WARRANTY

A. Special Project Warranty: Submit a written warranty, executed by the Contractor, Installer and the Manufacturer, agreeing to repair or replace carpeting which fails in materials or workmanship within the specified `warranty period. This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

1. Warranty period is two years after date of substantial completion.

B. Carpet manufacturer's material wear warranty: Ten years.

1.09 EXTRA MATERIALS

A. Tiles: Provide quantity of full tiles for each type of material equal to 5 percent of amount installed.

B. Deliver extra carpet materials to Owner's designated storage space, properly packaged with protective covering and identified with labels describing contents.

PART 2 PRODUCTS

2.01 CARPET

A. Manufacturers, Styles and Colors

1. Basis of Design: Manufacturers, styles and colors as indicated on the drawings.
2. Other Acceptable Manufacturers: Carpet manufactured by other manufacturers will be considered if materials meet the requirements of the Basis of Design performance and physical characteristics including but not limited to:
   a. Color, pattern, style
   b. Size, weight and gage
   c. Fiber characteristics, type and content.
   d. Density, yarn count, twist, stitches, pile weight and characteristics
   e. Primary and secondary backing
   f. Treatments

B. Types, Patterns and Colors: As indicated on Drawings.

2.02 WALK-OFF / ENTRANCE CARPET TILE MAT

A. Manufacturers, Styles and Colors

1. Basis of Design: Manufacturers, styles and colors as indicated on the drawings.
2. Other Acceptable Manufacturers: Walk off carpet manufactured by other manufacturers will be considered if materials meet the requirements of the Basis of Design performance and physical characteristics including but not limited to:
   a. Color, pattern, style
   b. Size, weight and gage
   c. Fiber characteristics, type and content.
   d. Density, count, weight and characteristics
   e. Backing
   f. Treatments

B. Types, Patterns and Colors: As indicated on Drawings.

2.03 ACCESSORIES

A. Carpet Edge Guard: Non-metallic type. Extruded or molded vinyl or rubber of size and profile indicated. Color as selected by Architect.

B. Adhesive: Non-toxic, water resistant, white latex base cement formulated for the installation of the manufactured materials. Type as recommended by carpet manufacturer.

1. Toxicity/IEQ: Adhesive must not have a VOC content greater than 50 g/L less water and exempted solids, as prescribed by South Coast Air Quality Management District Rule 1168.

C. Seaming Cement: Hot-melt seaming adhesive or similar product recommended by carpet manufacturer, for taping seams and buttering cut edges at backing to form secure seams and prevent pile loss at seams.

D. Miscellaneous Materials: As recommended by manufacturer of carpet and other carpeting accessory products; selected by installer to meet project circumstances and requirements.

E. Leveling Materials and Crack Fill: Non-staining latex cementitious type, compatible with carpet adhesive, as recommended by the flooring manufacturer.

PART 3 EXECUTION

3.01 PREPARATION

A. Installer must examine substrates for moisture content and other conditions under which carpeting is to be installed, and notify Contractor in writing of conditions detrimental to proper completion of the work.

1. Do not proceed until unsatisfactory conditions have been corrected.

B. Comply with CRI 2011 and with carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.

C. Concrete Substrates

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 flooring manufacturer. Do not use solvents.
3. Perform tests recommended by flooring manufacturer. Proceed with installation only after satisfying manufacturer’s recommendations for test results.

D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

E. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

F. Sequence carpeting with other work so as to minimize possibility of damage and soiling of carpet during remainder of construction period.

3.02 INSTALLATION

A. Install in accordance with recommendations of the manufacturers of materials and Carpet and Rug Institute's methods specified in CRI 2011. Carpet manufacturer's current installation instructions shall be kept at job site and be followed explicitly.

1. Comply with manufacturer's recommendations for installation of carpet; maintain uniformity of carpet direction and lay of pile, unless otherwise indicated.

B. Use modular carpet from the same dye lot in each room.

C. Lay carpet in accordance with the final shop drawings. No reversing of carpet direction shall be permitted.

D. Install modular carpet by trimming, cutting and prefitting units. Then apply adhesive in strict accordance with manufacturer's instructions, and place the carpet modules with the pile inclination in the direction as recommended by the manufacturer, or as otherwise indicated on the final layout drawings.

1. Application shall be full spread. Sprayed on adhesive is not permitted.
2. Install using a notched trowel.

E. Trim protruding ends of open loops so slightly below surrounding pile height.

F. Use edge molding where carpet terminates under doors and along edge of carpet where it abuts another floor material. Fasten edge moldings securely to the floor with glue manufactured for this specific purpose.

G. Roll entire area lightly to eliminate air pockets and ensure uniform bond.

3.03 CLEANING AND PROTECTION

A. Protect installed carpet to comply with CRI 2011 and carpet manufacturer recommendations.

B. Remove debris, sorting pieces to be saved from scraps to be disposed. Keep premises free and clear of waste material in connection with carpet work.

C. Vacuum carpet using commercial machine with face-beater element. Remove spots and replace carpet where spots cannot be removed.

D. Advise Contractor of protection methods and materials needed to ensure that carpeting will be without deterioration or damage at time of substantial completion.

E. Provide adequate protection for adjacent equipment, furnishings and materials.

F. When entering, passing through, or working in any space in the building that contains finished materials, maintain proper protection for floors, walls, ceilings, fixtures, etc. Repair or replace damaged adjoining work as directed by the Architect at no additional cost to the Owner.

END OF SECTION

SECTION 09 72 65

VINYL COATED FABRIC WALL COVERINGS

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide wall coverings of the types specified herein in locations indicated.

B. Provide accessory materials required for proper installation of wall coverings, such as primers, sealers and adhesives.

1.02 QUALITY ASSURANCE

A. Test panels at job site.

1. Install test panels for full-width and corner applications of wall covering material in areas designated by Architect. Include pattern matching where applicable.
2. Test panels will be actual location for the wall covering involved and if acceptable to Architect, they may remain in place. Replace test panels that are not acceptable to Architect until satisfactory installation is achieved.
3. Accepted test areas will be used as standard of acceptable workmanship for similar work.

B. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Surface-Burning Characteristics: As follows, per ASTM E 84:
2. Flame-Spread Index: 25 or less.
3. Smoke-Developed Index: 50 or less.
4. Fire-Growth Contribution: Materials to have no flashover and heat and smoke release according to NFPA 265.

1.03 SUBMITTALS

A. Samples

1. Furnish 2 samples of each type and color/pattern selection of wall covering materials specified. Each sample shall be full width by 36” long.
2. Include full description of samples submitted, including fire hazard classification and other properties.

B. Shop Drawings: Show location and extent of each wall-covering type. Indicate

pattern placement, seams and termination points.

C. Maintenance Instructions: For type of approved wall covering to be used, furnish 2 copies of manufacturer's printed instructions for maintenance and cleaning. Deliver to the Owner as directed by Architect.

1.04 DELIVERY, STORAGE AND HANDLING

A. Protect from damage at all times, with particular care in protecting against edge damage, crushing and staining.

B. Deliver materials in original package as container of manufacturer, clearly labeled to identify manufacturer, brand name, quality or grade, and fire hazard classification.

C. Store materials in original undamaged containers or packages, in manner recommended by manufacturer. Maintain temperature in storage area above 40 degrees Fahrenheit for at least 24 hours before installation.

1.05 JOB CONDITIONS

A. Maintain a constant minimum temperature of 65 degrees Fahrenheit at areas of installation for at least 48 hours before, during and 48 hours after the application of materials.

PART 2 PRODUCTS

[2.01 WALL COVERING MATERIALS

A. Manufacturers, Pattern and Colors

1. Basis of Design: As indicated on the drawings.
2. Other Acceptable Manufacturers: Wall covering manufactured by other manufacturers will be considered if materials meet the requirements of the Basis of Design and the color is an acceptable match as approved by the Architect.

B. Types: As indicated on Drawings.

C. Conformance: Exceeds Fed. Spec. CCC-W-408A, Type II.

D. U.L. Rating (Maximums).

1. Flame Spread: 20.
2. Fuel Contributed: 5.
3. Smoke Developed: 5.

2.02 ACCESSORY MATERIALS

A. Adhesives, Primers and Sealers: As required for installation of wall covering materials. For each type wall covering, furnish wall covering manufacturer's recommended materials manufactured expressly for use with the selected wall covering and compatible with wall surface involved. Provide materials that are mildew-resistant and non-staining to the wall covering.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine the surfaces and conditions under which wall covering is to be installed. Report any unsatisfactory conditions, and do not proceed until such unsatisfactory conditions, if any, are corrected. Commencement of work signifies acceptance.

B. Verify that normal temperature and humidity conditions during installation approximate the interior conditions that will exist when building is occupied.

3.02 PREPARATION

A. Remove hardware, wall plates, accessories and similar items as applicable to allow wall covering to be installed. Upon completion replace all items.

B. Prime and size seal, substrates in accordance with the wall covering manufacturer's recommendations for the type of substrate material to be covered. Sand rough spots if necessary and clean as required.

3.03 INSTALLATION

A. Apply all materials by skilled workmen in strict accordance with manufacturer's instructions for wall covering used.

B. Place wall covering panels consecutively in the order they are cut from rolls, including filling of spaces above or below openings as required.

C. Match adjacent panel strips as required, consistent with pattern selected. Install seams vertically and plumb, and at least 6" away from corners. Place wall covering continuously over corners, and assure seams at edges of panels are vertical and plumb.

D. Trim selvages as required to ensure color uniformity and pattern match at seams.

E. Remove excess adhesive along finished seams as recommended by manufacturer.

F. Have finished installation smooth, clean and free from wrinkles, gaps or overlaps. No horizontal seams permitted.

G. Do not soil or deface wall covering. If cleaning is required, use only materials and

methods recommended by manufacturer of wall covering used.

END OF SECTION

SECTION 09 77 53

VEGETATED WALL SURFACES

PART 1 - GENERAL

1.01 SUMMARY

A. Provide preserved garden and installation

1.02 ACTION SUBMITTALS

A. Product Data: Manufacturer's standard catalog as required, for installation and integration with other work for each type of product indicated.

B. Care Instructions: Manufacturer's standard Care Instructions & Display Recommendations

C. Shop Drawings: Submit shop drawings taking artists work and fleshing out the design intent for architect's review and approval. Do not fabricate work until approval has been received and VIF is complete. Include final shop drawings with dimensions for installation and integration with other work.

1. Include elevations and wall sections

D. Maintenance Instructions: Furnish maintenance instructions and recommended procedures for maintenance of preserved garden system, for use during construction and for use after acceptance of the work.

1.03 QUALITY ASSURANCE

A. Manufacturer/Fabricator: A firm with no less than 5 years' experience in producing preserved garden systems similar to that indicated for this Project and whose products have a record of successful in-service performance, as well as sufficient production capacity to produce required units complying with the requirements of this Section

B. Installer Qualifications: As approved by manufacturer.

C. Mockups: Before fabricating and installing, build mockups for the approved design required to verify selections made under sample submittals, and to demonstrate aesthetic effects and qualities of material fabrication and execution. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Demonstrate the proposed range of aesthetic effects per design submittal and workmanship.
2. Obtain Architect's approval of mockups before starting garden panel fabrication.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Inspect preserved garden system packaging after delivery for signs of damage during transit. Confirm correct quantity and sizing of components prior to installation process.

B. Protect preserved garden system packaging from damage during delivery, storage and handling from damage, spoilage and deterioration.

1. Store preserved garden panels unassembled, in their original packaging in dry space with climate-controlled conditions and per manufacturer's Care Instructions & Display Recommendations.

1.05 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install paneling until building is enclosed, wet work is completed, and HVAC system is operating and will maintain temperature between at occupancy levels 60 and 85 deg F and relative humidity less than 70 percent during the remainder of the construction period. Obtain and comply with Manufacturer’s and Installer’s coordinated advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install work until these conditions have been attained and stabilized.

B. Inspect and confirm that the wall behind the preserved garden system is rigid, and if requested prior, has fire retardant treated plywood blocking properly placed to receive green wall panel systems and fasteners.

1. Verify that the structure is capable of bearing the load of the preserved garden system.

C. Protect installed panels from damage by adjacent work.

1.06 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that preserved garden panels can be supported and installed as indicated.

1.07 PROJECT WARRANTY

A. Special Warranty: Warrant plants against defects in materials and workmanship, including deterioration, discoloration and dislodging for a period of 5 years from substantial completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Systems specified are as produced by GARDENS ON THE WALL.

1. Pattern: Refer to Arch drawings
2. Size: Refer to Arch drawings

2.02 PERFORMANCE REQUIREMENTS

A. Structural Requirements: Provide Preserved Garden Wall systems capable of withstanding the effects of gravity loads as follows:

1. Structure shall support 2 lb/sq ft and dead loads of preserved garden panels system weight.

B. Fire Resistance: Provide products tested to comply with the following fire resistance rating when tested in accordance with ASTM E84.

1. Flame Spread Rating: 25 or less
2. Smoke Developed Rating: 50 or less

2.03 COMPONENTS

A. General: Provide garden panels consisting of 100% natural plants and flower foliage, harvested, and preserved through a process that replaces the sap with a plant based and biodegradable preservative liquid, without toxic components.

1. Preserved moss, foliage and plants, arranged to comply with artist sketches and/or rendering and approved makeup created in coordination with Architect and Owner, submitted for approval.

2.04 FABRICATION GENERAL

A. 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. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

B. Shop cut openings, to maximum extent possible, penetrants, fixtures and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine finish surfaces, substrates and project conditions to verify that substrates are acceptable for the installation of preserved garden system.

B. Do not start installation work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install wall panels in accordance with manufacturer's written installation instructions and rules and regulations of local codes.

B. Assemble work and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Install work level, plumb, true, and straight to a tolerance of 1/4 inch in 96 inches, with no variations in flushness of adjoining surfaces.

D. Anchor work to anchors or blocking built in or directly attached to substrates. Secure to grounds, with screws, French cleats, and blind nailing as required for complete installation.

3.03 ADJUSTING AND CLEANING

A. Repair damaged and defective work or replace.

B. Clean preserved gardens so they are accepted at final completion.

C. Remove all excess materials, debris and equipment from the site. Repair any damage that has resulted from installation.

END OF SECTION

SECTION 09 91 00

PAINTING

PART 1 GENERAL

1.01 SCOPE

A. Work Included

1. Surface preparation and painting or finishing of all interior and exterior exposed items and surfaces except as otherwise indicated. Work includes, but is not necessarily limited to, the following:
   a. Walls, ceilings and soffits: Gypsum board
   b. Hollow metal doors and frames.
   c. Wood trim, casework and millwork as required.
   d. Exposed structure including deck and all framing.
   e. Exposed ferrous metal of any type, interior and exterior, including galvanized items.
   f. Exposed sheet metal, ductwork, conduit and piping in finished spaces; not mechanical equipment or electrical equipment rooms.
   g. Exposed prime coated or unfinished mechanical or electrical items outside of mechanical equipment rooms. Repaint factory finished mechanical or electrical items where specified.
   h. Other items noted or specified.
2. Surface preparation, priming and coats of paint specified are in addition to shop priming and surface treatment specified under other sections of the work.

B. Mechanical Equipment Rooms: Painting subject to the following requirements:

1. Paint finish on walls and ceiling, when scheduled on drawings, to be applied prior to installation of mechanical/electrical work as much as possible.
2. Spray painting not permitted after electric motors have been installed.

C. Work Excluded: Do not paint the following items unless specifically called for on the drawings or specified herein:

1. Concrete floors.
2. Shop or prime coats on items to which shop or prime coats have been applied by the fabricator, unless noted otherwise.
3. Exterior concrete.
4. Items with factory finish or natural finish (brick, stone, stainless steel, aluminum, and others) unless noted or indicated elsewhere.
5. Colored concrete masonry units.
6. Wall areas permanently concealed by fixed equipment or accessories.

7. Sprayed fireproofing and items receiving sprayed fireproofing.
8. Equipment, sheet metal, ductwork and equipment in mechanical and electrical rooms; painting of these items, if required, provided under Divisions 23 and 26 as applicable.
9. Piping in mechanical rooms, except exposed gas and fire protection piping.
10. Concealed, miscellaneous metal, except for shop prime coat touch-up.
11. Factory finished equipment, except for touch-up, unless otherwise specified herein.
12. Concealed piping.
13. Communication and data wiring in cable trays
14. Items permanently concealed above ceilings.

D. Surface Preparation

1. It is the intention of this specification that new substrates will be ready for decoration as specified herein except for normal construction dust and soiling.
2. Surfaces and materials installed by other trades are required to be acceptable for work specified under Part 3, Surface Preparation. Specifically, new surfaces to be clean, sound, free from loose particles, dirt, loose mortar and grease.

1.02 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.03 QUALITY ASSURANCE

A. Application: Performed only by skilled, experienced painters.

B. Provide lead free prime and finish coatings. All top coatings shall be mold and

mildew resistant.

C. Coordination: Provide finish coats compatible with prime paints used. Review other specification sections to ensure compatibility of total coating system with prime paints provided for the various substrates. Provide barrier coats over non-compatible primers or remove primer and reprime as required. Notify the Architect of anticipated problems using coating systems specified on substrates primed in accordance with other section requirements.

D. Reference Specifications

1. The following Society for Protective Coatings (SSPC) specifications are referenced by code number within this Section.

Code	Method
SP-1	Solvent Cleaning
SP-2	Hand Tool Cleaning
SP-3	Power Tool Cleaning
SP-6	Commercial Blast Cleaning
SP-11	Power Tool Cleaning to Bare Metal
SP-16	Brush-off Blast Cleaning of Non-Ferrous Metals

E. Paint walls prior to installing wall mounted signage.

1.04 SUBMITTALS

A. Submit a complete selection of manufacturer's color chips indicating color, texture and sheen for approval for each finish specified herein.

B. Submit a complete schedule for identifying manufacturer and specific brand name or number of products proposed for finishing specified surfaces.

1. Provide percent of solids by volume content data for each paint material.
2. Provide paint label analysis and application instructions for each type paint.

C. Provide one (1) unopened gallon of each type and color of paint and stain required for maintenance purposes. Provide original, unopened, labeled containers with color samples and a list of project use. Extra materials are not to be used for touch-up by Contractor.

D. Color/Finish Samples

1. After receiving color chips from the Contractor, the Architect will provide a complete schedule of colors and sheens desired.
2. Obtain schedule well in advance of commencing work and submit samples of specified finishes for approval.
3. Submit duplicate samples on the same kind of materials to which finishes

will be applied. One half of the sample shall show the completed treatment and the other half shall show the successive steps, taken in producing the finish. When approved, samples will be so marked; one set will be retained by the Architect and one set will be returned for the painter's use.

4. No finishes shall be applied on the work until samples are approved. Approved samples shall be strictly duplicated in the work. Additional coatings, if required to reproduce approved samples, shall be applied without additional cost to the Owner.
5. Use representative colors when preparing samples for Architect's review.

E. Statement From Manufacturer

1. Contractor, in submitting the list of proposed subcontractors, shall include for approval, along with the name of the painting subcontractor, the names of the manufacturers whose materials the subcontractor proposes to use in the work.
2. Following tentative approval of the subcontractor and the materials manufacturers, notify the manufacturers, in writing, that the specifications require the manufacturers to submit to the Architect, a statement by a corporate officer of the manufacturer that coatings scheduled by the Architect are proper for the intended use and that the manufacturer's representative will be available to advise the Architect and the Contractor regarding applications of all coatings.

F. Close-Out Material List: Provide a list of all paint and coating materials used on the project. Include manufacturer, product number, color and room/location where used.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials on the job site in original, new, unopened packages and containers bearing the manufacturer's name and label, and the following information:

1. Name or title of material.
2. Manufacturer's stock number and date of manufacture.
3. Manufacturer's name.
4. Contents by volume, for major pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.

B. Store, protect and handle materials in accordance with manufacturer's recommendations to prevent damage and deterioration. Store paint materials at minimum of 50^{o} F.

C. Maintain paint material storage space as clean, non-hazardous and orderly. Place waste and soiled paint rags in tightly covered metal containers; safely dispose of at end of each working day. Take every precaution to avoid fire hazards and

spontaneous combustion. Provide acceptable type of fire extinguisher immediately adjacent to paint storage area.

1.06 PROJECT CONDITIONS

A. Coordinate painting and finishing work with other trades to ensure adequate illumination, ventilation and dust-free environment during application and drying of paint and finish treatments.

B. Maintain uniform interior building temperature of minimum 50° F for 24 hours before, during and continuously for 48 hours after painting.

C. Do not apply coatings when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Provide adequate ventilation as required for specified paint and finish treatment materials in spaces scheduled. Maintain for time periods recommended by material manufacturer to provide proper drying.

E. Provide adequate illumination on surfaces to be finished. Maintain a minimum 80 foot candle lighting level measured mid-height at substrate surface.

F. Protect adjoining surfaces against damage or soiling.

G. Maintain work in neat and orderly condition, promptly removing empty containers, wrappings, soiled rags, waste and rubbish from site.

H. Material Safety Data Sheets (MSDS): Provide documents available to Owner's Representative and construction personnel at the job site. Comply with MSDS requirements.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Paint: Brands of paint and stain are specified in "Paint and Material Finish Schedule," only to establish a standard of quality. Other paint brands and manufacturers such as BENJAMIN MOORE; BEHR/KILZ; MARTIN SENOUR; PPG PAINTS; PRATT AND LAMBERT; CORONADO PAINT COMPANY, SHERWIN WILLIAMS are acceptable with proof of comparable products and satisfactory experience records for the intended use. Comply with VOC content of materials specified.

1. Colors: As indicated on drawing; colors not indicated to be as selected by Architect.

2.02 MATERIAL GENERAL

A. Material Compatibility

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

2.03 ACCESSORY MATERIAL

A. Application Equipment: Not required to be new, but shall be adequate for the work and workmanship required herein.

B. Accessories: Provide all required ladders, scaffolding, drop cloths, masking, scrapers, tools, dusters and cleaning solvents as required to perform the work and achieve the results specified herein.

C. Secondary products not specified by name (i.e. turpentine, thinners, mineral spirits, fillers, linseed oils, etc.) shall be "best grade" or "first line" products.

1. Filler material shall be woodworker's option of material that can be tinted and worked so as to match adjacent wood surfaces.

2.04 EXTERIOR PAINT AND FINISH MATERIAL SCHEDULE

A. Apply paint and finish materials to substrate surfaces indicated. Apply touch-up prime coats in addition to shop-applied prime coats. Provide additional job site prime coats when indicated.

B. Metals - Ferrous: Galvanized and Shop Primed (Semi-Gloss).

1. SW
   a. Primer: SW ProCryl Universal Metal Primer BB-310 Series One (1) Coat
   b. Finish: S-W Pro industrial Acrylic Semi-Gloss Coating B66-650 Series. Two (2) coats.
2. PPG
   a. Primer: Pitt-Tech Plus 4020 Acrylic Interior/Exterior Primer/Finish DTM Industrial Primer 4020 PF Series. One (1) coat.
   b. Finish: Pitt-Tech Plus 4216 HP Acrylic Interior/Exterior Semi-Gloss DTM Industrial Enamel 4216 Series. Two (2) coats.

C. Metal – Ferrous: Unprimed (Semi-Gloss).

1. SW
   a. Primer: SW ProCryl Universal Metal Primer BB-310 Series One (1) Coat
   b Finish: S-W Pro industrial Acrylic Semi-Gloss Coating, B66-650

Series . Two (2) coats.

2. PPG
   a. Primer: 4020 Acrylic Interior/Exterior Primer/Finish DTM Industrial Primer. One (1) coat.
   b. Finish: 4216 HP Acrylic Interior/Exterior Semi-Gloss DTM Industrial Enamel 4216 Series. Two (2) coats.

2.05 INTERIOR PAINT AND FINISH MATERIALS SCHEDULE

A. Apply paint and finish materials to substrate surfaces indicated. Apply touch-up prime coats in addition to shop-applied prime coats. Provide additional job site prime coats when indicated.

B. Gypsum Board and Plaster – Walls.

1. SW
   a. Primer: ProMar 200 Zero VOC Interior Latex Primer B28W2600 Series.
   b. Finish:. ProMar 200 Zero VOC Interior Latex Eg-shel B20 Series Two (2) coats.
2. PPG
   a. Primer: SpeedHide zero Interior Zero VOC Latex Sealer 6-4900XI Series. One (1) coat.
   b. Finish: Speedhide zero Interior Zero VOC Latex Eggshell 6-4310XI Series. Two (2) coats.
3. Surfaces: Gypsum board wall surfaces.

C. Gypsum Board and Plaster – Ceilings/Soffits.

1. SW
   a. Primer: ProMar 200 Zero VOC Interior Latex Primer B28W2600 Series.
   b. Finish: ProMar 200 Zero VOC Interior Latex Flat B30 Series . Two (2) coats.
2. PPG
   a. Primer: Speedhide zero Interior Zero VOC Latex Sealer 6-4900XI Series. One (1) coat.
   b. Finish: Speedhide zero Interior Zero VOC Latex Flat 6-4110XI Series. Two (2) coats.
1. Surfaces: Ceilings, soffits, bulkheads

D. Gypsum Board and Plaster – Walls - Epoxy

1. SW
   a. Primer: ProMar 200 Zero VOC Interior Latex Primer B28W2600 Series . One coat.
   b. Finish: Pro Industrial Pre-Catalyzed Water Based Epoxy K46 Series. Two coats.

2. PPG
    a. Primer: SpeedHide zero Interior Zero VOC Latex Sealer 6-4900XI. One (1) coat.
    b. Finish: Pitt Glaze WB1 Semi-Gloss Water Based Pre-Catalyzed Acrylic Epoxy 16-510 Series. Two (2) coats.
3. Surfaces: Where indicated.

E. Metals - Ferrous: Shop Primed and Unprimed.

1. SW
    a. Primer: S-W Pro Industrial Pro-Cryl Primer, B66-310 Series
    b. Finish: S-W Pro industrial Acrylic Semi-Gloss Coating, B66-650 Series. Two (2) coats.
2. PPG
    a. Primer: Pitt-Tech Plus 4020 Acrylic Interior/Exterior Primer/Finish DTM Industrial Primer. One (1) coat.
    b. Finish: Pitt-Tech Plus 4216 HP Acrylic Interior/Exterior Semi-Gloss DTM Industrial Enamel 4216 Series. Two (2) coats.
3. Surfaces: Hollow metal doors, frames, door mullions, ferrous metal surfaces.

F. Metals - Ferrous: Galvanized.

1. SW
    a. Primer: ProCryl Universal Metal Primer B66-310 Series
    b. Finish: S-W Pro industrial Acrylic Semi-Gloss Coating, B66-650 Series. Two (2) coats. Two (2) coats.
2. PPG
    a. Primer: Pitt-Tech Plus 4020 Acrylic Interior/Exterior Primer/Finish DTM Industrial Primer.
    b. Finish: Pitt-Tech Plus 4216 HP Acrylic Interior/Exterior Semi-Gloss DTM Industrial Enamel 4216 Series. Two (2) coats.
3. Surfaces: Hollow metal doors, frames, door mullions, railings, galvanized metal surfaces.

G. Steel Stairs and Railings: Steel and Iron Finish

1. SW
    a. Prime Coat: Procryl Primer B66-310. One coat.
    b. Finish Coat (All steel exposed to view): Water Based Acrolon 100 Urethane B65-720 Series. Two coats.
2. BENJAMIN MOORE
    a. Prime Coat: Waterborne Polyamid Epoxy Gray Primer Series M42. One (1) coat.
    b. Finish Coat (All Steel Exposed to View): Waterborne Urethane Semi-Gloss Finish Series M73S. Two (2) coats.
3. PPG
    a. Prime Coat: Multiprime Low VOC High Performance Universal Primer 4360 Series. One (1) coat.

b. Finish: Amershield Low VOC Polyester Acrylic Polyurethane Enamel AMV-3/01. Two (2) coats.

H. Exposed Structure - Ferrous (Eg-Shel): Dryfall

1. SW
   a. Primer: ProCryl Universal Primer, B66-310 Series
   b. Finish: Low VOC Waterborne Acrylic Dry Fall, B42W82 Two coats.
2. PPG
   a. Primer: Pitt-Tech Plus 4020 Acrylic Interior/Exterior Primer/Finish DTM Industrial Primer 4020 PF Series. One (1) coat.
   b. Finish: Speedhide Interior Super Tech WB Acrylic Dry Fog Latex, 6-725XI. Two (2) coats
3. Surfaces: Exposed metal decking, trusses, structural steel, metal joists.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine substrate surfaces and installation condition. Report condition(s) that might affect proper application.

B. Do not proceed with painting work until unsatisfactory conditions have been corrected.

C. Initial application of paint to a surface constitutes acceptance of existing conditions and responsibility for satisfactory performance.

D. Examine specification sections of other trades and their provisions regarding painting. Surfaces left unfinished shall be painted or finished as part of the work of this Section unless specifically noted otherwise.

3.02 SURFACE PREPARATION

A. General

1. Broom clean and remove excess dust before painting is started in any area.
2. Broom cleaning is not permitted after operations have begun in a specific area.
3. Surfaces shall be clean, dry and adequately protected from dampness.
4. Surfaces shall be free of any foreign materials that will adversely affect adhesion or appearance of applied coating.
5. Remove any mildew and neutralize the surface prior to applying coating.

B. Structural Steel and Miscellaneous Ferrous Metal

1. Bare Metal Surfaces
    a. Remove grease, oil, dirt and other foreign material prior to prime coat application where necessary according to SP-1, SP-2 and/or SP-3.
    b. Power tool clean remove rust prior to prime coat application according to SP-11.
    c. Include all hangers and miscellaneous fabricated items.
2. Shop Primed Surfaces
    a. Fill open joints or abrasions in shop prime coat with filler; feather edges, sand smooth, and touch-up with primer compatible with shop primer. Extend primer beyond treated area.
    b. Remove grease, oil, dirt and other foreign material prior to prime coat touch-up where necessary according to SP-1, SP-2 and/or SP-3.
    c. Include all hangers and miscellaneous fabricated items.

C. Galvanized or Zinc-Coated Items

1. Pretreat surfaces prior to application of prime coat with phosphate pretreatment, similar to Great Lakes Labs, “Clean and Etch”, Dupont’s Metal Conditioner #5717 or PPG DX 579, unless prime coat material to be used is recommended by its manufacturer for direct application over zinc treated surfaces of the type at hand. Follow manufacturer's directions.
2. Remove dirt or grease on surfaces scheduled for paint finish according to SP-1. Wipe dry with clean cloths.
3. Roughen surface with steel wool as necessary to remove gloss.

D. Gypsum Board

1. Fill minor irregularities with spackling paste.
2. Sand to smooth level surface and dust off.
3. Avoid raising nap of paper.

3.03 APPLICATION

A. General

1. Only skilled mechanics shall be used.
2. Apply all paint in strict accordance with the manufacturer's instructions. Data sheets take precedence over these specifications if more restrictive.
3. Do not apply until preceding coat is dry to manufacturer's recommendations.
4. Do not apply to any surface unless it is thoroughly dry.
5. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes if moisture content of surface is greater than recommended by manufacturer.
6. Do not use material that has exceeded the pot life stated by the manufacturer.
7. Apply to the following workmanship requirements:

a. Neat appearance of finished surfaces.
b. Absence of ridges, sags, runs, drops, laps, unnecessary brush marks, holidays, air bubbles and excessive roller stipple.
c. Thorough mixing of paint and limited use of thinners.
d. Uniformity of film thickness.
e. Proper drying time between coats.
f. Protection of unpainted and finished surfaces.

8. Coverage and hide shall be complete. When color or undercoats show through final coat, recoat until the paint film is of uniform finish, color, appearance, and coverage, at no additional cost to Owner.
9. Edges of paint or finish adjoining other materials or colors shall be sharp and clean without overlapping.

B. Methods

1. Application may be by roller, brush, spray or other approved means.
2. When utilizing spraying, be careful not to use methods which will affect other trades work in adjacent areas.

C. Mixing

1. Mechanically mix before use.
2. Agitate during application as required.
3. Do not tint or shade in field unless permitted by Architect.

D. Thinning

1. Dilute only as required to achieve suitable application viscosity.
2. Use only type and amount recommended by manufacturer.

E. Approvals: Do not apply succeeding coat of paint until previous coat has been inspected and written approval is given.

F. Electrical Conduits

1. Do not paint any electrical conduit or boxes unless they are exposed and abutting a surface that is to be painted or stained.
2. Conduits and boxes to be painted shall be given a coat of galvanizing pretreatment followed by the paint system for the adjoining surface.

G. Protection of Surfaces

1. Provide covers, drop cloths and masking to protect unpainted surfaces previously finish painted. Use special care in protecting electrical and mechanical items which may be damaged by the painting operations (i.e., overspray and solvents that might damage the internals of the item).
2. If possible, remove items not to be painted such as hardware, accessories, electrical plates, lighting fixtures and/or trim, mechanical grilles and louvers and similar items in contact with painted surfaces.

3. Use caution when painting exterior work to avoid wind carrying overspray, drippings, etc., onto adjacent structures, facilities and vehicles.
4. Following completion of painting, reinstall removed items by workmen skilled in the trade involved and remove all covers, masking and drop cloths.

END OF SECTION

SECTION 10 14 10

INTERIOR SIGNAGE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide the following interior signs:

1. Maximum occupancy limit.
2. Tactile (ADA) exit signs

B. All signs which identify permanent facilities/accommodations shall be tactile and braille and limited minimally to room numbers, restrooms, stairways, floor identification, elevators, exit and room names as deemed appropriate by the Owner, local jurisdictions, codes, and Fire Marshall.

C. Intent of this specification is to establish required signage for project occupancy and for bidding purposes. Final design material intent is to be established with Owner staff and their consultants.

D. All signage types and quantities are to be submitted and approved per local jurisdictions, codes and Fire Marshall before fabrication.

1. Architect to provide a template and plans, Signage contractor to layout the maps, submit to the Fire Marshal authority for review and acceptance.

1.02 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Submit manufacturer's product data, where applicable, and complete drawings showing all identifying devices and installation details.

1. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
2. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign.

C. Samples: Submit samples for materials, finishes, colors, letter styles, etc., as required for selection and approval by Architect prior to fabrication of identifying devices.

1. Sample for Verification: Full-size sample.

D. Final signage schedule must be approved by Owner prior to fabrication. Submittal

to Owner should be made through the Architect.

1.03 QUALITY ASSURANCE

A. Signage Standards: Conform to the Americans with Disabilities Act (ADA) Standards and ANSI A117.1 where applicable and to the extent as indicated.

B. Acceptable Manufacturers: All units are to be custom fabricated; manufacturer's products meeting the specifications will be acceptable. Manufacturers must be regularly engaged in fabrication and installation of signage units and related identifying devices.

1. Fabricator shall make at least one visit to the site before production begins to review all sign locations and installation conditions with Architect and Owner's representative.
2. Fabricator must review all dimensional changes with Architect.

C. Approvals: All identifying devices shall be approved at the fabricator's shop by the Architect prior to shipment and installation.

D. Spelling and Braille Accuracy: Responsibility of sign manufacturer.

E. The Owner has the right to renumber the room numbers during construction. Manufacturer must not begin fabrication of room number plates until room numbers have been approved by the Owner, in writing, through the Architect.

F. Room identifications will be provided to the Contractor by the Owner during construction.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original shipping cartons with seals unbroken.

B. Protect materials from physical damage.

C. Store materials in clean, dry area.

D. Inspect all materials prior to installation to assure proper function and condition of all items.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Locations, Quantities, Graphics and Copy: As indicated on drawings and/or specified (scheduled) herein.

B. Sign System: Provide with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and

profiles

2.02 MATERIALS

A. Acrylic Plates: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

1. Colors: As selected by Architect.
2. Thickness: 1/4"
3. Vinyl Film: UV-resistant vinyl film with pressure-sensitive, permanent adhesive; die cut to form characters or images as required.
4. Backer: 1/8” thick white PVC adhered to backside and not visible from front.

B. Aluminum Sheet and Plate: ASTM B 209 alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

C. Changeable Copy: Provide back-up plate laminated to back of face plate to create slot for removable nameplates.

D. Provide an integral method to create tactile and Braille signs; producing a unitary component. Glued on or laminated letters or Braille cells are not acceptable.

2.03 DESIGN GUIDELINES

A. Plate Shape: Square cornered; do not bevel edges.

B. Letter Style: Font as indicated or selected.

1. ADA Signs: All capital letters.
2. All Other Signs: Mixed upper and lower case.
3. Copy Position: 3/4” from left or as indicated.

C. Tactile Letters and Braille: Grade II braille; raised 1/32" above background surface. Provide Braille clear dome topped. Sign manufacturer shall be responsible for verifying accuracy of spelling, both tactile and Braille.

D. Letter Size

1. Tactile Signs: Minimum letter size is 3/4" for capital letters. Room numbers to be 1".
2. Non-tactile Signs: Between 3/8" and 1" capital letter height. Larger letters are permitted on directional signs or on signs where reading distance is greater than 15'-0".

2.04 SIGNS REQUIRED FOR TACTILE/BRAILLE

A. Tactile (ADA) Exit Signs: Approximately 6w” x 4” plate with 1" high capital letters on plate. Braille centered directly below the type copy.

2.05 SIGNS REQUIRED FOR NON-TACTILE/BRAILLE SIGNAGE

A. Plate Shape: Square cornered; do not bevel edges.

B. Maximum Occupancy Limit: 6" x 6" plate with 3/4" letters indicating “Maximum Occupancy of this space is: (EXAMPLE - 250 People).

1. Occupancy number height: 1”

2.06 COPY POSITION

A. Lines of copy laid out flush left with a margin of 3/4" along the left edge of plate. Exceptions as indicated.

B. Left hand, right hand and bottom margins are 3/4". Vertical spacing measured between lower case letters is 3/8". Overall width and height of a plate is achieved with multiples of 3/4".

PART 3 EXECUTION

3.01 INSTALLATION

A. Mount signs plumb and level.

B. Mount all interior identification devices with 3/4" foam tape on all four edges.

C. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.

3.02 SIGNAGE SCHEDULE

A. Posted Occupancy Limit: Provide at all rooms exceeding 49 occupants.

B. Tactile (ADA) Exit Signs: Locations to be determined and approved by local codes and jurisdiction authorities.

C. Sign Locations

1. Single Doors: Locate signs on the wall next to the latch side of the door, 1" from the outside edge of the door frame and with the top edge of the uppermost sign 61-1/2" A.F.F.
2. Pairs of Doors: Locate signs as specified above for single doors, except Architect will direct in field if sign occurs on right or left jamb of opening.
3. Doors with Borrowed Lights: Locate as directed by Architect.

3.03 CLEAN UP

A. After completion of work remove all debris and tools from the premises, clean all adhesive spatter and run-over from finished surfaces and wash all plated clean of

fingermarks and soil. Polish sign surfaces with a soft cotton rag.

END OF SECTION

SECTION 10 22 21

DEMOUNTABLE GLASS PARTITIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes unitized, movable partition system consisting of aluminum framed glass fixed panels with swinging and sliding glass doors.

1.02 REFERENCES

A. American with Disabilities Act (A.D.A.). ICC/ANSI A117.1 Guidelines for Accessible and Useable Buildings and Facilities

B. American Society for Testing and Materials (ASTM)

1. B221: Aluminum-Alloy Extruded Bars, Rods, Wires, Shapes and Tubes.
2. C1396: Gypsum Wallboard.
3. C1036: Standard Specification for Flat Glass
4. E84: Test for Surface Burning Characteristics of Building Materials.
5. E90: Test for Laboratory Measurement of Airborne Sound transmission Loss of Building Partitions.
6. E413: Classification for Rating Sound Insulation.
7. E1300: Standard Practice for Determining Load Resistance of Glass in Buildings

C. IFMA X5.6-1986: Standard for Office Furnishings; Panel Systems, Tests.

D. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials.

E. ICBO: Uniform Building Code

F. ICC: International Building Code

1.03 SYSTEM DESCRIPTION

A. Unitized Movable Partition System

1. Product of manufacturer regularly engaged in Work of this Section.
2. Unitized, full-height, movable partition system for interior use, designed to permit relocation, reconfiguration, and reuse of all parts.
3. Non-progressive; allow for removal and reinstallation of panels from either side of partition and at any point in a given panel run without disturbance of adjacent panels.
4. Panels, corner posts and finished end conditions to be joined with single flush panel connector.
5. Erected and disassembled in a manner to prevent damage to adjacent building surfaces and elements, including floors, walls, ceilings, columns, and window mullions.

6. All panels of like module, regardless of type, to be interchangeable, utilizing the same panel connector post cap.
7. Panel connection system to accommodate addition of slotted standards and brackets for mounting of systems furniture wall units produced by various manufacturers.
8. Single sliding barn style aluminum framed glass doors Door units interchangeable with like sized panels using same connection method as panels.
9. Panels complete with unitized base that is factory installed to eliminate loose hardware on floor when panels are moved.
10. Floor Gripper Plates designed as an integral part of floor channel, not requiring activation or adjustment upon panel installation. Plates allow for left or right adjustment of each panel without lifting panel from the floor.
11. System components constructed and finished at factory, not requiring additional construction or finishing in the field.
12. Spring loaded wall starter channel units to be complete with integrated gasket to ensure tight fit for sound and light seal.

B. Performance Requirements

1. Acoustical Attenuation: Overall STC rating of 38 when tested in accordance with ASTM E90 and classified in accordance with ASTM E413.
2. Vertical Load Capacity: Comply with ANSI/BIFMA X5.6.
3. Lateral Load Capacity: Wall panels to comply with partition design requirements for lateral load resistance as specified by the Uniform Building Code (Sections 1611.5 & 1632), the BOCA National Building Code Sections 1604.5.6, 1606.9, & 1610.6), the Standard Building Code (Sections 1604.5, 1607.6, & 1610.1), or the International Building Code (Sections 1604.3, 1607.13, & 1621). Glass framing to comply with requirements of Chapter 24 of each of the codes listed and with part 9 of the NBCC 1995.
4. Flame Spread Rating: Maximum 25 when tested in accordance with ASTM E84.

1.04 SUBMITTALS

A. Submit for all items.

B. Shop Drawings: Include panel layout in plan and elevation, opening locations, special panels, conditions at adjacent construction, and accessories.

C. Product Data: Provide data on panel system, components, and accessories.

D. Samples: Submit 2 samples 12” long x full width indicating trim finish.

E. Manufacturers Installation Instruction: Indicate procedures, special conditions, and protection.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Installation performed by factory personnel or others authorized by partition system manufacturer.

B. Conform to ICC/ANSI A117.1 (ADA) for mounting heights and location of components and NBCC 1995 Section 3.8.

1.06 PROJECT CONDITIONS

A. Do not begin installation until site conditions provide complete protection from weather and environmental conditions in building are approximately equivalent to those which will exist after installation:

1. Temperature: 60 to 85 degrees F (16 to 29 degrees C).
2. Relative Humidity: Maximum 70 percent.

1.07 WARRANTY

A. Provide manufacturers warranty against defects in materials and workmanship for a period of 10 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Infinium – Quantum Single Butt Glazed

B. Acceptable Alternate Manufacturer: D-Hive

2.02 MATERIALS

A. Aluminum Extrusions: Architectural Grade aluminum prime billet. Provide manufacturer's standard sizes, shapes and profiles for members of the systems and components.

1. Aluminum alloy and temper as recommended by manufacturer to comply with requirements of performance, fabrication, application of finish and control of color. Comply with ASTM B221 for extruded shapes.
2. Provide all miscellaneous extrusions to complete the sliding door and fixed sidelight assemblies.

B. Fasteners: Aluminum or non-magnetic stainless steel. Provide concealed fasteners wherever possible. Provide Phillips flat-head machine screws where exposed. Finish exposed fasteners to match aluminum work. Other concealed fasteners may be zinc plated or cadmium plated steel.

C. Glass and Glazing: Provide 3/8" thick tempered glass materials complying with Section 08 81 00 requirements. Glazing gaskets shall be manufacturer's standard vinyl extrusion.

2.03 HARDWARE

A. Prepare and reinforce doors for hardware. Factory fit and install door pulls on each side of door. Match existing at adjacent building.

1. Pull (Slide) Handles: 1” diameter brass, 8” center-to-center mount, 2-1/2” clearance. 630 finish.
2. Sliding Door Guide: Manufactures standard.

3. Seals and Stops: Manufactures standard.
4. Hinges: Manufactures standard.

2.04 DOORS

A. Basis of Design Sliding Door: Frameless

B. Basis of Design Swing Door: Frameless

PART 3 PRODUCT

3.01 INSTALLATION

A. General

1. Do not install component parts which are observed to be defective, including warped, bowed, dented, abraded and broken members. Remove and replace members which have been damaged during installation or thereafter before time of acceptance.
2. Do not cut or trim component parts during erection, in a manner which would damage finish, decrease strength, or result in a visual imperfection or a failure in performance of the work.

B. Install all components in accordance with the manufacturer's installation instructions and recommendations.

C. Install component parts level, plumb, true to line and with uniform joints and reveals. Secure to structure with non-staining and non-corrosive shims, anchors, fasteners, spacers and fillers.

D. Install glass and glazing, in accordance with Section 08 81 00 and the manufacturer's requirements.

E. Adjust operating hardware to function properly, without binding and to provide tight proper fit at contact points.

3.03 CLEANING AND PROTECTION

A. Protect glass from breakage immediately upon installation, by attachment of streamers to framing held away from glass. Do not apply markings of any type to surfaces of glass.

B. Immediately before acceptance of the work, clean the aluminum sliding glass doors thoroughly. Demonstrate proper cleaning methods to Owner's maintenance personnel during final cleaning. Prepare a "Cleaning and Maintenance Manual" listing types of cleaning compounds, cleaning methods and glazing materials used for cleaning, repair and maintenance of work and turn over to Owner upon acceptance of the work.

END OF SECTION

SECTION 10 26 00

WALL PROTECTION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work under this section includes the following:

1. Stainless steel corner guards.

1.02 REFERENCE STANDARDS

1. ADA 4.4, 4.26 - Americans with Disabilities Act.
2. ASTM E84 - Surface Burning Characteristics of Building Materials.
3. UL - Underwriters Laboratories Classifications.

1.03 QUALITY ASSURANCE

A. Manufacturer: Firm with minimum five years experience in successfully producing wall guards and wall panels similar to that indicated for this project.

B. Installer qualifications: Engage an installer who has no less than 3 years experience in installation of systems similar in complexity to those required for this project.

C. Fire performance characteristics: Provide engineered PETG wall protection system components with UL label indicating that they are identical to those tested in accordance with ASTM E84 for Class 1 characteristics listed below:

1. Flame spread: 25 or less
2. Smoke developed: 450 or less

D. Impact Strength: Provide assembled wall protection units that have been tested in accordance with the applicable provisions of ASTM F476.

E. Chemical and stain resistance: Provide wall protection system components with chemical and stain resistance in accordance with ASTM D543.

F. Single source responsibility: Provide all components of the wall protection system manufactured by the same company to ensure compatibility of color, texture and physical properties.

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 23.

B. Shop Drawings: Clearly indicate the following for each type of wall protector:

1. Type of wall protector identified by manufacturer's model numbers including profiles, sizes, accessories and finish.
2. Types and sizes of wall anchors for each type of wall construction.

C. Samples: 6" long full size samples representative of each type of wall protector specified.

D. Manufacturer's certification indicating compliance with ADA Accessibility Guidelines for Protruding Objects.

1.05 DELIVERY, HANDLING AND STORAGE

A. Products shall be delivered to job-site in original unopened packages bearing manufacturer's labels.

B. Store and protect products in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 STAINLESS STEEL CORNER GUARDS

A. Description: 16 gauge, Type 430, stainless steel with satin finish. Provide with 1/8” radius corner.

B. Wing Width: 2" typical.

C. Angles: As indicated. Custom angles required.

D. Length: From top of base to finish ceiling.

E. Adhesive: Types as recommended by corner guard manufacturer for substrates encountered.

F. Fasteners: Types as recommended by manufacturer for substrates encountered.

2.02 MATERIALS

A. Adhesives: As recommended by protection product manufacturer. Provide and comply with project VOC and sustainability requirements.

2.03 FABRICATION

A. Fabricate wall protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.

B. Factory Assembly: Assemble components in factory to greatest extent possible

to minimize field assembly. Disassemble only as necessary for shipping and handling.

C. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface preparation: Prior to installation, clean substrate to remove dirt, debris and loose particles. Perform additional preparation procedures as required by manufacturer’s instructions.

B. Protection: Take all necessary steps to prevent damage to material during installation as required in manufacturer’s installation instructions.

3.03 INSTALLATION

A. Install items in accordance with manufacturer's instructions and directions.

B. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

1. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.
2. Where splices occur in horizontal runs of more than 20 feet, splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches.
3. Adjust termination caps as required to ensure tight seams.

3.04 CLEANING

A. Remove protective material from all wall protectors and clean in accordance with manufacturer's recommendations.

B. Remove surplus materials, rubbish and debris resulting from installation as work progresses and upon completion of work.

3.05 PROTECTION

A. Protect installed materials to prevent damage by other trades. Use materials that may be easily removed without leaving residue or permanent stains.

END OF SECTION

SECTION 10 44 00

FIRE EXTINGUISHERS AND CABINETS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide fire extinguishers and cabinets as shown and specified.

1. Provide fire extinguishers with wall brackets in non-finished areas (i.e. mechanical rooms, electrical rooms, etc.).

1.02 RELATED SECTIONS

A. Masonry (coordination for recessed cabinets): Section 04 00 00

1.03 QUALITY ASSURANCE

A. Provide fire extinguishers complying with Fire Protection Association (NFPA) Pamphlet No. 10.

B. Provide only new portable fire extinguishers fully loaded, tested and approved by Underwriter's Laboratories (UL), and ready for use.

C. Fire-Rated, Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.

1. Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. Samples: Submit 6” x 6” sample for each type of exposed finish required.

1.05 COORDINATION

A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of recessed fire protection cabinets with wall depths.

1. Coordinate location of fire extinguisher cabinets prior to construction of concrete masonry walls. Verify recessed type installations and coordinate these locations with the masonry construction.
   a. Provide mason with rough opening size of cabinets.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Portable Fire Extinguishers

1. J. L. INDUSTRIES
5. LARSEN'S MANUFACTURING COMPANY
6. POTTER-ROEMER
7. WATROUS

B. Fire Extinguisher Cabinets

1. J.L. INDUSTRIES
2. LARSEN'S MANUFACTURING COMPANY
3. POTTER-ROEMER
4. WATROUS

B. Where a specific manufacturer's product is specified herein it is to establish a level of quality. Products by the other manufacturers listed are acceptable providing they meet these specifications.

2.02 FIRE EXTINGUISHERS

A. Multipurpose Dry-Chemical Type: Fabricate in accordance with NFPA No.10, 10A, and 10L and UL Standards, except hose, gauge face cover, and horn cone parts shall be metal. No plastic or nylon valves, trigger/handle, casing, or gauge will be acceptable. Fire extinguishers, unless indicated otherwise, shall be 10 Ib. multi-purpose dry chemical type for use on A, B, and C fires (4A-60BC), with hose and horn.

1. Provide this type throughout facility, unless noted otherwise.

B. Wet Chemical Type: Fabricate in accordance with NFPA No.10, 10A, and 10L, UL Standards, and State Codes, except hose, gauge face cover, and horn cone parts shall be metal. No plastic or nylon valves, trigger/handle, casing, or gauge will be acceptable. Fire extinguishers shall be 6 liter potassium acetate wet chemical type for use on Class K fires.

1. Provide wet chemical extinguishers in kitchen area and where noted.

C. Size: 21-1/2" high x 8-1/2" wide x 5" deep.

2.03 FIRE EXTINGUISHER CABINETS

A. Provide steel construction.

B. Basis of Design: Drawings and specifications are based on LARSEN Architectural Line with full glass door. LARSEN catalog numbers are listed to establish a standard of quality and mounting type. Equal products may be provided from the listed acceptable manufacturers. Provide the following wall mounting types where a specific type of cabinet is indicated on the drawings.

1. Recessed - Steel: 2409-R, Flat Trim.
2. Semi-Recessed - Steel: 2409-6R.
3. Doors: Full glass

C. Coordinate final model size with fire extinguisher.

D. Finish

1. Steel: Baked enamel or powder-coat.
   a. Color: As selected by Architect.

E. Mounting Brackets: Provide manufacturer's standard plated finish, heavy duty mounting brackets for surface mounted fire extinguishers. Provide proper size and type for capacity of extinguishers indicated.

F. Fire Rated Cabinets: Listed and labeled to meet requirements of ASTM E814 for fire resistance rating of wall where it is installed.

1. Construct fire rated cabinets with double walls fabricated from 0.0478 inch thick, cold rolled steel sheet lined with minimum 5/8 inch thick, fire barrier material.

G. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate the words "FIRE EXTINGUISHER" vertically on cabinet door.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

2.04 CABINET FABRICATION

A. Provide standard steel box with trim, frame, door and hardware to suit cabinet type, trim style and door indicated. Weld all joints and grind smooth; miter and weld door frames. Fabricate trim in one piece with corners mitered, welded and ground smooth. Open miters are not acceptable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets will be installed.

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

3.02 PREPARATION

A. Prepare recesses for recessed and semi-recessed fire protection cabinets as required by type and size of cabinet and trim style.

3.02 INSTALLATION

A. Install fire extinguishers and fire extinguisher cabinets where indicated or as directed by Architect in accordance with manufacturer's instructions and recommendations. Mount at heights indicated, when not indicated as directed by Architect.

B. Securely anchor brackets and cabinets to substrate construction with toggle bolts or expansion anchors. Lead, wood or plastic plugs and fasteners are not acceptable.

C. Fire extinguishers are to be fully charged and ready for use when building is turned over to the Owner. Extinguishers shall be certified as fully charged by an approved fire extinguisher service company and shall be tagged or labeled as such.

3.03 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust cabinet doors that do not swing or operate freely.

B. On completion of installation, clean interior and exterior surfaces as recommended by manufacturer.

C. 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 and mounting bracket manufacturers.

D. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

E. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 11 31 00

RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide appliances where indicated on drawings consisting of:

1. Under Counter Refrigerator
2. Refrigerator/freezer
3. Television

1.02 RELATED SECTIONS

A. Electrical Rough-In: Included under Electrical Contract, Division 26.

B. Data Rough-In: Included under Electrical Contract, Division 26.

1.03 SUBMITTALS

A. Manufacturer's Product Data: Submit for all items in accordance with the General Conditions.

PART 2 PRODUCTS

2.01 ITEMS

A. Finishes: All residential appliances and other appliances to be stainless steel.

B. Refrigerators in ANSI Type A and UFAS units must be vertical side-by-side type; or of the over under type and meet the following requirements: Have at least 50 percent of the freezer space below 54 inches AFF; and, have 100 percent of the freezer controls below 54 inches AFF. Freezers with less than 100 percent of the storage within an accessible reach range must be self-defrosting.

C. Manufacturers listed are to establish a standard of acceptable quality and basis of design. Dimensions of basis of design products are critical for compliance with ADA/ANSI requirements and casework layouts as indicated in drawings. Except where no substitution is indicated, similar products by other manufacturers listed below are acceptable provided they are an acceptable match in performance, characteristics and exact dimensions. All proposed substitutions to be approved by Architect.

1. KENMORE
2. KITCHEN AID
3. AMANA

4. GENERAL ELECTRIC
5. MAYTAG
6. FRIGIDAIRE

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B. Under Counter Refrigerator: WHIRLPOOL Model WUR35X24HZ; stainless steel.

C. Refrigerator/Freezer: FRIGIDAIRE, Model GRSC2352AF; stainless steel.

D. Television: SONY Model K55S30 (55”), TCL Model 65QM751G (65”)

1. SAMSUNG
2. SONY
3. LG
4. TOSHIBA
5. INSIGNIA
6. TCL

PART 3 EXECUTION

3.01 INSTALLATION

A. Install all items in accordance with manufacturer's instructions.

B. Provide all required accessories and fasteners to ensure a complete installation.

END OF SECTION

SECTION 11 52 23

TELEVISION MOUNTING BRACKETS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide flat screen television wall mount brackets complete with all accessories for mounting at locations indicated on the drawings or specified.

B. Coordinate mounting heights, electrical and AV feeds, cable management and television equipment with Owner and Architect.

1.02 RELATED SECTIONS

A. Wood Blocking: Section 06 10 50.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's product data for all items.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver items in manufacturer's original protective packaging.

B. Store items in original packaging to prevent physical damage.

C. Handle so as to prevent damage to finished surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Specifications are based on mounting brackets manufactured by PEERLESS INDUSTRIES, INC. Catalog numbers are listed to establish a level of quality and performance.

B. Other Manufacturers: Similar models manufactured by BRETFORD MANUFACTURING, DA-LITE or. are acceptable provided the units meet the requirements specified herein.

2.02 MOUNTING BRACKETS

A. Wall Mount Type: SmartMount Universal Tilt Wall Mount. Fixed height, tilting.

1. Television Size Range: 39 to 75”.

2. Double bracket style with universal mounting arms.
3. Maximum Load Capacity: 175 pounds.
4. Finish: Matt black, powder coat.
5. Tilt Adjustment Capability: 15° forward.
6. Horizontal Adjustment: Up to 8.00" for centering display on wall.
7. Vertical Adjustment: Up to 0.25" of vertical adjustment on each universal display adaptor bracket for post-installation leveling and height adjustment fine-tuning.

B. Provide all hardware, mounting adapters, templates and fasteners for assembly and attachment of the bracket to substrates indicated.

C. Coordinate mounting of ceiling units with required overhead mounting steel and brackets.

PART 3 EXECUTION

3.01 INSTALLATION

A. In accordance with manufacturer's instructions.

B. Verify that wood blocking has been provided in stud/gypsum board walls. Blocking to be located at mounting hardware.

C. Coordinate placement of miscellaneous steel above ceiling for connection to building framing members.

D. Clean-up: Remove all cartons, debris, scraps, etc. and leave spaces clean and have brackets ready to use.

END OF SECTION

SECTION 12 33 55

MANUFACTURED PLASTIC LAMINATE CLAD CASEWORK

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide plastic laminate casework as indicated on drawings. Countertops and custom pieces are specified under Section 06 40 00.

B. Accessories common to casework are included as work of this section.

1.02 RELATED SECTIONS

A. Wood Blocking: Section 06 10 50.

B. Countertops: Section 06 40 00.

C. Custom Casework: Section 06 40 00.

D. Vinyl Base: Section 09 65 00.

1.03 QUALITY ASSURANCE

A. Fabricator qualifications: A firm specializing in the fabrication of millwork with a satisfactory record of performance on projects of comparable size and quality. Fabricator manufacturing, materials and installations shall adhere to applicable AWI Quality Standards Illustrated and be acceptable to the Architect.

B. Installation: Performed only by experienced skilled finish carpenters.

C. Catalog Standards

1. Manufacturer's catalog numbers, where shown, are for convenience in identifying cabinet work.
2. Use of a specific manufacturer's catalog numbers is not to preclude the use of any other acceptable manufacturer's product or procedures that may be equivalent.

D. Reference Standards: Wherever the following abbreviations are used herein, they shall refer to the corresponding standard:

1. ANSI: American National Standards Institute.
2. AWI: Architectural Woodwork Institute.
3. NEMA: National Electrical Manufacturer's Association.
4. ASTM: American Society for Testing and Materials.

5. CS: Commercial Standard.

E. Quality Grade: Materials and fabrication shall be "custom grade" in accordance with "Quality Standard Illustrated," of the AWI conforming to the following sections:

1. Section 200: Plywood and particleboard.
2. Section 400: Casework.
3. Section 1700: Installation

1.04 DEFINITIONS

A. Exposed Portions of Casework: Include surfaces visible when doors and drawers are closed. Bottoms of casework more than 4 feet above floor and tops less than 6 feet 6 inches above floor shall be considered as exposed. Visible members in open cases or behind glass doors also shall be considered as exposed portions.

B. Semi-Exposed Portions of Casework: Includes those members behind opaque doors, such as shelves, divisions, interior faces of ends, case back, drawer sides, backs and bottoms, and back face of doors. Tops of casework 6 feet 6 inches or more above floor shall be considered semi-exposed.

C. Concealed Portions of Casework: Include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's/fabricator's data and installation instructions for each type of casework unit.

B. Samples: Submit samples of specified finishes.

C. Shop Drawings

1. Submit shop drawings for casework showing plans, elevations, ends and cross sections.
2. Show details and location of anchorages and fitting to floors, walls and base.
3. Include layout of units with relation to surrounding walls, doors, windows and other building components.

1.06 DELIVERY, STORAGE AND HANDLING

A. Protect casework during delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver casework until concrete, masonry and other similar wet work has been completed and is thoroughly dry, outside door openings are permanently watertight, exterior windows are glazed and, in case of temperature dropping below 60^{o} F., until temporary heating and ventilating systems are in operation.

C. Store casework in dry, well-ventilated spaces with constant minimum temperature of 60° F., and maximum relative humidity of 55%.

1.07 PROJECT CONDITIONS

A. Do not deliver or install plastic laminate product until the following conditions are met:

1. Windows and doors are installed and the building is secure and weather tight.
2. Ceiling, overhead ductwork and lighting are installed.
3. All painting is completed and floor tile is installed.
4. Interior building temperature to be between 60° and 80° F, and ambient relative humidity maintained between 25% and 55% prior to delivery, and during and after installation.

B. Obtain measurements and verify dimensions and details before proceeding with finish carpentry.

1.08 WARRANTY

A. Plastic laminate faced casework to be guaranteed by manufacturer, and Contractor jointly and severally to the Owner for five years, to be free of defects due to faulty materials, workmanship, or performance.

B. Warranty not to include damage sustained as a result of abuse, negligence, use beyond that of it's intended function by the Owner, acts of God, or unnatural events or causes beyond the control of the manufacturer.

C. Include repair and replacement of defective materials and components at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Particle Board (Substrate for Laminate Surfaces): High density industrial grade with a minimum density of 45 pounds per cubic foot and a moisture content between 9% maximum and 6% minimum, meeting or exceeding ANSI A208.1 Grade M-3 or ASTM D1037.

B. Fiberboard: Uniform, medium density conforming to ANSI A208.2. Maximum moisture content of 8%. Meet the following minimum standards:

1. Internal Bond: 125 psi.
2. Modulus of Rupture: 4,000 psi.
3. Modulus of Elasticity: 400,000 psi.
4. Screw Holding Power: 325 pounds.

5. Density: Minimum 50 pounds per cubic foot.

C. Hardboard: Tempered, smooth both sides; conforming to ANSI/AHA A135.4 Class 1.

D. Lumber: Optional framing material for concealed framing. Conform to AWI requirements premium grade; provide in suitable species of manufacturer's option.

E. Plastic Laminate: Conform to the requirements of the National Electrical Manufacturer's Association (NEMA) Publication Number LD-3. Colors, patterns and finishes as indicated.

1. General Purpose Horizontal Grade: 0.05 inches thick.
2. General Purpose Vertical Grade: 0.028 inches thick.
3. Backing Sheet Grade: 0.02 inches thick.
4. Post-Forming Grade: 0.042 inches thick.
5. Cabinet Liner: 0.02 inches thick.
6. Fill and seal plastic laminate joints with Seamfil by KAMPEL ENTERPRISES, INC. or FormFill by FORMFILL PRODUCTS (UNIKA USA). Colors specifically mixed by manufacturer to match plastic laminate.
7. Manufacturer and Color: As indicated
8. Other Acceptable Manufacturers: Solid surface manufactured by the following companies are acceptable providing they meet the requirements specified herein and the colors and pattern are an acceptable match as determined by the Architect.
   a. FORMICA
   b. PIONITE
   c. NEVAMAR

F. Edging Materials

1. 1mm PVC banding, machine applied.
2. 3mm PVC banding, machine applied and machine profiled to 3 mm radius.
3. Colors: As selected by Architect.

G. Pressure Fused Laminate/Interior Surfacing

1. Melamine resin impregnated, 100 gram PSM minimum, surface laminated to core under pressure.
2. Meet NEMA LD3.1-1991 GP28 standards and NEMA LD3-1991 CL20 standards.
3. White pressure fused laminate for cabinet interiors behind door and drawers, interiors of all open cabinets unless otherwise specified, and underside of wall cabinet unless otherwise specified.
4. Shall be balanced at all concealed surfaces with phenolic backer. Unsurfaced coreboard not allowed.

H. Hardware Items: All exposed hardware to be (polished brass) (satin stainless

steel) (polished stainless steel) finish.

1. Drawer Slides: Self-closing, side mounting type with nylon tire, steel ball-bearing rollers. Manufactured by BLUM, GRASS, AMEROCK, KNAPE & VOGT; ACCURIDE. Load capacity as follows:
   a. 75 pounds: Drawers up to 3-1/2 inches deep: Similar to ACCURIDE Series 2132.
   b. 100 pounds: Drawers up to 8 inches deep: Similar to ACCURIDE Series 2832.
   c. 150 pounds: Drawers over 8 inches deep, all file drawers: Similar to ACCURIDE Series 4034.
2. Drawer and Door locks: 5-pin tumbler removable core, dead bolt. BEST; COMPX NATIONAL; CORBIN. Key and masterkey locks as directed by Associate Architect. Provide 2 keys per cylinder and 5 masterkeys per master set.
3. Hinges: 5-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide 2 for doors 48 inches high or less and 3 for doors more than 48 inches high
4. Drawer and Door Pulls: Indicated on the drawings.
5. Adjustable Cabinet Shelf Supports: 5mm spoon type; nickel plated.
6. Catches: Magnetic, STANLEY #45 or equal by NATIONAL LOCK or EPCO.

I. Glue: Waterproof adhesive (phenol, resorcinol or melamine) base meeting requirements of CS 253 for "Wet Use" unless otherwise specified in specific sections.

J. Plywood: Birch hardwood plywood conforming to AWI Section 200 for veneer core material, AWI "custom" grade, provide with waterproof glue.

2.02 FABRICATION - CASEWORK

A. General: Except as specified hereinafter, fabricate all work in accordance with AWI quality standards as specified. Work not specified with a level of quality shall be not less than "Custom" quality per AWI.

1. "Flush Overlay" design as shown in AWI Architectural Casework Details
2. Provide complete factory-fabricated and finished components which, when assembled on site, will provide an integral system of storage and work surfaces.
3. Provide locks where indicated.
4. Make cut-outs and other provisions for the work of other trades and as indicated or required for installation.
5. Assemble cabinets with accurate router grooves 1/8" deep with glue and nails and screws.
6. Apply plastic laminate to exposed ends after assembly to conceal screws in end cabinet.
7. All particle board panels to be balanced construction.

B. Subbases: Provide continuous plywood closed bases capable of being leveled to meet site conditions; subbase to be unfinished to receive resilient base. See Section 09 65 00.

C. Base Cabinets

1. Sides and Bottoms: Construct of 3/4" thick particle board with interior of cabinet finished with cabinet liner or polyester laminate. Provide balanced constructed panels with neutral colored backer sheet at concealed conditions and finish laminate at exposed conditions.
2. Backs: Standard 1/4" prefinished hardboard. Install in housed joints in surrounding panels. All backs exposed to view to be neutral colored except where indicated to match vertical color surfaces.
   Rear, unexposed side of backs to receive continuous hot melt glue at joint between back and sides/top/bottom for sealing against moisture and vermin, and to further contribute to cabinet stability.
3. Frame: Provide frame construction of 3/4" thick particle board or lumber dadoed into sides at the following:
   a. As sub-top.
   b. At all locked drawers and doors.
4. Runners: Provide runners or frame construction between all drawers.
5. Shelves: Provide fixed and adjustable shelves with particle board core where indicated on drawings. Provide shelves adjustable on 1/2" centers. Except for exposed shelving conditions, finish shelves with neutral colored polyester laminate or liner grade laminate
   a. Shelves under 36" wide: 3/4" thick, except all open shelves to be 1" thick.
   b. Shelves 36" to 42" wide: 1" thick.
   c. Shelves over 42" wide: Construct in accordance with AWI Section 400 to support minimum 30 lbs./running foot of shelf with deflection limited to 1/4" or provide intermediate supports to limit the span to ranges specified above.
   d. Edges: Except where cabinet design requires matching laminate self edge, provide 3mm PVC on Front & Back Edges, 1mm PVC on Side Edges.
6. Finish
   a. Casework Edges: Except where cabinet design requires matching laminate edges, finish front edges of sides, frames, and bottom with 3mm PVC machine applied edge.
   b. Exposed Exterior of Casework: Finish exposed portion of cabinet with vertical grade plastic laminate in solid color finish as selected by Architect.
   c. Interior of Casework
      1) Semi-Concealed (behind doors): Neutral colored polyester or cabinet liner laminate.
      2) Exposed: Vertical grade laminate to match exposed casework.

D. Drawers

1. Body: Construct of fiberboard with polyester laminate finish on faces and PVC on exposed top edges. Subfronts, sides and back fabricated with shouldered lock joint or dado construction and routed to receive bottom.
    a. Sides and Back: 1/2" thick.
    b. Subfront: 5/8" thick.
2. Bottom: 1/4" thick prefinished hardboard, housed and glued, into front, sides and back. Underside of drawer to receive continuous hot melt glue at joint between bottom and back/sides/front for sealing and rigidity. Reinforce drawer bottoms as required with intermediate spreaders.
3. Front: 3/4" thick particle board front finished with vertical grade plastic laminate on exposed face and cabinet liner laminate on interior side; total thickness 13/16" thick. Except where cabinet design requires self edge matching laminate edges (see cabinet design), edges to be finished with 1mm PVC.
    a. Where adjacent door sizes require core thickness in excess of 3/4", provide drawer fronts to match door thickness. Verify conditions with Architect.
4. Install on proper sized slides specified herein.

E. Doors: Construct and finish same as drawer fronts except core construction to vary as follows:

1. Doors over 30" x 48": Construct from 1" to 1-1/4" thick particle board core.
2. Doors over 36" x 60": Construct as 1-3/8" thick hollow core units in accordance with AWI Section 1300.

F. Wall Cabinets: Construct and finish same as base cabinets except provide suitable hang rail of 3/4" plywood secured to cabinet frame.

1. Where wall cabinets close to soffit or ceiling, provide fascia scribed to conditions and leveled on bottom to permit level installation of cabinets. Finish of fascia to match cabinet.

G. Design

1. Configuration of casework is indicated on drawings.
2. The detailing and design required to provide rigid, solid and structurally adequate casework is the responsibility of the fabricator; within parameters of AWI specifications and as approved by Architect.
3. The following conditions require special attention:
    a. Casework exceeding 42" in width between supports.
    b. Sink and/or equipment cutouts and supports.
    c. Countertops exceeding 24" unsupported.
    d. Wall and Ceiling Mounted Casework: Provide integral framing in casework of size, strength, and in locations which allow unit to be screw attached to proper substrate and remain rigidly in place.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of laboratory casework.

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

302 PREPARATION

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

3.03 CASEWORK INSTALLATION

A. General

1. Install plumb, level, true and straight with no distortions so that doors and drawers will fit openings properly and be accurately aligned.
2. Shim as required using concealed shims.
3. Where casework abuts other finished work, scribe and apply filler strips for accurate fit with concealed fasteners.
4. Where possible, assemble units into one integral unit with joints flush, tight and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16".
5. Anchor cabinet units securely in place with concealed (when doors and drawers are closed) fasteners, anchored into structural support members of wall construction. Comply with manufacturer's instructions and recommendations for support of unit.
6. Adjust casework and hardware so that doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

B. Base Cabinets

1. Fasten each individual cabinet to floor at toe space, with fasteners spaced at 24" on center.
2. Bolt continuous cabinets together.
3. Secure individual cabinets with not less than 2 fasteners into floor, where they do not adjoin other cabinets.

C. Wall Cabinets

1. Verify that wood blocking has been installed at required locations.
2. Bolt continuous cabinets together.
3. Secure individual cabinets with not less than 2 fasteners into wall (wood blocking), where they do not adjoin other cabinets.

3.02 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed upon completion of installation.

1. Patch surfaces damaged by installation to prior condition as approved or replace damaged units as directed.

B. Clean shop-finished surfaces, touch-up as required, and remove or refinish damaged or soiled areas, as acceptable to Architect.

1. Dust cabinet interiors. Clean exterior surfaces to original condition.

C. Advise Contractor of procedures and precautions for protection of materials and installed casework from damage by work of other trades.

END OF SECTION

SECTION 21 00 00

FIRE PROTECTION - GENERAL

PART 1 GENERAL

1.01 REFERENCES

A. Sections 21 00 00 through 21 13 19, cover Fire Protection work specifically.

B. Applicable Division 1 and General Conditions terms and conditions (if any).

C. Applicable building construction authorities, codes, standards and guidelines for all Fire Protection Contract elements, including but not limited to the following:

-mechanical code applies to hood exhaust fire suppression systems-

1. Ohio Building Code, including Fire Protection and Mechanical portions thereof.

2. Local Fire Department.

3. State of Ohio Fire Marshall's Office.

4. State Ohio Energy Code.

-EPA and board of health apply to halon and clean agent extinguishing systems, drinking and potable water systems, low suction cut-offs for pumps, lead free construction and installation requirements, etc.-

5. Franklin County Board of Health.

6. State of Ohio Environmental Protection Agency (E.P.A.).

7. NFPA pamphlet no. 13, INSTALLATION OF SPRINKLER SYSTEMS.

8. NFPA pamphlet no. 70, NATIONAL ELECTRIC CODE.

9. NFPA pamphlet no. 72, NATIONAL FIRE ALARM CODE.

10. City of Columbus water utility provider.

11. American National Standards Institute (ANSI) standards for materials and construction.

12. American Society of Mechanical Engineers (ASME) standards for materials and construction.

13. American Society for Testing and Materials (ASTM) standards for materials, construction and testing.

26. National Sanitation Foundation (NSF) standards for materials and construction.

27. Underwriter’s Laboratories (UL) standards for materials and construction.

28. Underwriter’s Laboratories (UL) standard 300, FIRE TESTING OF EXTINGUISHING SYSTEMS FOR PROTECTION OF RESTAURANT COOKING AREAS.

29. Factory Mutual (FM) standards for materials and construction.

30. The manufacturer's installation guidelines and recommendations for individual items, elements and/or systems indicated herein.

31. The Owner's material and installation guidelines and/or standards.

32. The Owner's insurance underwriter's material and installation guidelines and/or standards.

1.02 SCOPE

A. The Fire Protection Contractor shall furnish all labor, materials, tools, incidentals and details necessary to provide a complete system of Fire Protection work as herein specified, as shown on plans, and as indicated or required by work under separate contract included with complete project documentation. Coordinate installation and interface requirements with the appropriate contractors in advance.

B. Note that work in this contract is associated with the partial remodeling/revision of an existing structure. Work in this contract shall include items/elements within the remodeled/revised area(s), as well as adjacent areas (including above and below) as necessitated for connection to and/or incorporation with existing systems. Extent of remodeling/revised work area(s) shall be as indicated by and confirmed from architectural documentation. Unless indicated otherwise, the following conditions shall apply:

1. All Fire Protection Contract new supply and drain piping, and any other piped utilities as included shall connect to, and/or operate in conjunction with existing building Fire Protection systems and elements.

2. When new work connects to, and/or operates in conjunction with existing building Fire Protection systems and elements, this contractor shall be responsible to provide an installation which shall operate and function properly without conflict or impairment to existing systems or elements upon completion of project. This shall include all necessary adjustments, balancing and confirmation of proper operation as required.

3. Remove or relocate existing Fire Protection items/elements as required to accommodate ALL new work. New work includes items/elements provided under separate contract.

4. This contractor shall be responsible for removal, repair and replacement of existing structures (floors, walls, partitions, ceilings, etc.) as necessitated by new work, or removal of existing items/elements. Repair and replacement to match original condition and adjacent structures in type, kind and finish.

G. The edition of all applicable NFPA Pamphlet's as recognized and amended by the Building Code Inspection/Approval Authority shall be the minimum requirement for all materials and methods. Unless indicated otherwise, <and as a quality standard only,> all materials shall be listed by Underwriter's Laboratories, Inc., and Factory Mutual Laboratories as approved for fire protection installations, when such is available.

-option, fully sprinkled-

H. Fire protection sprinkler installation to be as required to provide "fully sprinkled" protection/coverage for the entire structure.

J. In brief, the Scope of the Work shall include, but is not limited to the following:

1. Connection to existing fire protection supply and drain piping within the existing structure.
2. Post Indicator Valves.
3. Standpipe System with interior fire department hose valve connections.
4. Automatic Sprinkler Systems throughout the structure, including “wet” and “dry” pipe systems.
5. Modification to existing sprinkler system as required by remodeling/renovation/revision work at existing structure.
7. Alarm valves; flow, pressure and tamper switches; and other alarm initiating devices.
9. Tele/Communication room(s)/area(s) dry pipe sprinkler protection system(s), including interlocked pre-action detection and control.
12. A new current conditions site water service flow test shall be performed with the results to be recorded and used by the FP contractor for preparation of required hydraulic design calculations.
13. Complete FP construction document layout plans and hydraulic design calculations in accordance with NFPA criteria. A copy of the new flow test shall be attached to the hydraulic calculations.

K. In brief, scope of work shall include, but is not limited to the following:

1. Water supply for the fire protection "limited area sprinkler system" to be from a single connection to the domestic water piping system; downstream of domestic meter and backflow prevention elements, and upstream of all other take-offs.

-option-

1. Water supply for the fire protection “limited area sprinkler system” to be from a single connection to the building standpipe supply piping system.

-confirm with local authorities, including fire dept, board of health and/or plumbing unit. for smaller systems, a "dual check" backflow preventor may be allowed.

delete when supplied from building standpipe system-

2. A listed/approved double check backflow prevention assembly shall be provided in the fire protection "limited area sprinkler system" piping immediately adjacent to the domestic water system connection.
3. The isolation valves furnished with the backflow prevention assembly shall be furnished with individual tamper switches chained and padlocked in the open position.
4. A water flow indication switch shall be furnished and installed in the fire protection "limited area sprinkler system" supply piping, downstream of and adjacent to the the backflow preventor, and upstream of all sprinkler heads. Appropriate testing elements shall be provided for the flow switch, including an inspector's test valve and discharge piping with a union orifice fitting to provide flow equal to to that from a single sprinkler head.
5. A pressure gauge with an isolation ball valve shall be furnished and installed in the fire protection "limited area sprinkler system" supply piping, downstream of and adjacent to the the backflow preventor, and upstream of all sprinkler heads.
6. Complete and operational fire protection supply piping distribution manifold and automatic sprinkler head installation as required to provide proper coverage and protection for the sprinkled area(s).
7. A new current conditions site water service flow test shall be performed with the results to be recorded and used by the FP contractor for preparation of required hydraulic design calculations.
8. Complete FP construction document layout plans and hydraulic design calculations in accordance with NFPA criteria. A copy of the new flow test shall be attached to the hydraulic calculations.

L. Wiring:

1. Unless indicated otherwise, all internal operation/control wiring incidental to the fire protection system shall be the responsibility of the Fire Protection Contractor, except wiring indicated by the Electrical Contract Documentation shall be by the Electrical Contractor. Electrical contract work includes external power input wiring to Fire Protection contract items/elements, and wiring for flow alarms, supervisory switches, and any other alarm initiating or supervisory devices to and from the central fire alarm panel provided in the Electrical Contract.

2. All wiring (if any) in the Fire Protection contract, including low voltage, shall be installed in conduit. All wiring, conduit and installation shall be in accordance with the National Electrical and Fire Alarm Codes, and the requirements of Division 16, Electrical Specification.

3. The Fire Protection Contractor shall coordinate with the Electrical Contractor as required for proper installation and operation of items wired by the Electrical Contractor. This includes providing the locations of all devices to be wired to the Electrical Contractor at the first opportunity, and coordinating the voltage and any other electrical requirements for all devices.

-verify licensing authority-

M. This Contractor to be licensed by the State of Ohio Authorities/Agencies having jurisdiction for installation and service of fire protection systems, including alarm, detection, control and extinguishing components as indicated herein.

N. Failure on the part of the Fire Protection Contractor to fulfill the above requirements will not relieve him of the responsibility of executing all work necessary for a complete and approved installation without extra expense to the Owner.

1.03 GENERAL CONDITIONS

A. Scheduling of all work performed by this Contractor shall be completely coordinated with the owner's representative.

B. All material hoisting by trade involved.

C. Arrangements for storage of tools and material, removal of debris, and interruptions of services shall be made with the owner's representative.

D. All piping, equipment and other material installed by this Contractor shall be located to miss all ceiling inserts, openings and sleeves for work of all trades, except where otherwise noted. This Contractor is referred to the complete construction documentation for the project available on request from the owner's representative.

E. All connections to, or revisions in, existing piping or facilities shall be done at such time as agreed to by the owner's representative, and all work shall be scheduled as required under "General Conditions". Revisions to the existing piping systems must be done with the minimum of shutdown time. All piping shall be run to the point of new connections and new equipment installed and ready to operate before any connections are to be made.

F. Extreme care shall be taken to avoid interference with the Owner's operations, processes, personnel & equipment, especially in the existing portion of the building occupied by the owner & in use during construction. Consult with the owner's representative regarding any points where interference is likely to occur and follow dimensions carefully where given on the Drawings. Pay particular attention to minimum clear heights when indicated on the Drawings.

G. It is mandatory that dust, dirt & debris be held to a minimum. This Contractor shall provide drop cloths, screens, curtains, etc., to protect the owner's operations, processes, personnel & equipment from dust, dirt & debris during the course of his work. All damage to existing elements or finishes shall be repaired by this Contractor upon removal of protective elements. All protective elements, methods & materials shall be approved by the owner's representative before any work is started in the area involved.

H. The Contractor, insofar as this Contract is concerned, shall at all times keep the premises and the building in a neat and orderly condition.

I. At the completion of the project, this Contractor shall promptly clean up and remove from the site all debris and excess materials associated with the execution of work in his contract.

J. DRAWINGS

1. Consult all Contract Drawings which may affect the locations of any equipment, apparatus, piping and ductwork and make minor adjustments in location to secure coordination.

2. Piping and equipment layout is schematic and exact locations shall be determined by structural and other conditions and verified in the field. This shall not be construed to mean that the design of the system may be changed, it refers only to the exact location of piping and equipment to fit into the building as constructed, and to coordination of all work with piping and equipment included under other Divisions of the Specifications.

3. The layout shown on the Drawings is based on a particular make of equipment. If another make of equipment is used which requires modifications or changes of any description from the Drawings or Specifications, this Contractor shall be responsible for making all such modifications and changes, including those involving other trades, as a part of this Contract and the cost thereof shall be included in his Bid. In such case, the Contractor shall submit Drawings and Specifications showing all such modifications and changes prior to starting work, which shall be subject to the approval of the owner's representative.

4. The owner's representative reserves the right to make minor changes in the location of piping and equipment up to the time of rough-in without additional cost to the Owner.

5. Mechanical equipment room layout as shown is arranged with adequate space for service and access. This Contractor shall adhere to the clearances shown when installing equipment and piping. Final location of equipment in this contract is subject to approval by the owner's representative.

6. Where certain grades and/or elevations are given on the Drawings, they have been obtained from the best information available; however, they are not guaranteed. This Contractor MUST assume the full responsibility of verifying present elevations in the field and making any adjustments as may be necessary, all of which must be included in his Bid Price.

7. Due to the scale of the Drawings, it is impossible to show all offsets and transitions which may be required. This Contractor shall carefully investigate the conditions affecting all work and shall furnish all elbows, fittings, transitions, etc., required to accomplish the desired result at no additional cost to the Owner.

8. Install all work as close as possible to walls, structural, members, etc., consistent with the proper space for covering, access, etc., so as to occupy the minimum of space and allow as much space as possible between ductwork, piping, etc. and the ceiling.

9. Actual dimensions shown on the Drawings and field dimensions shall take precedence over scaled dimensions.

K. ENERGY CODE

1. All applicable elements in the Fire Protection System must comply with all requirements of the State of Ohio "Code of Energy Conservation", except where Building Fire Protection & Life Safety Code supercedes those requirements. This includes, but is not limited to, efficiencies, power factors, insulation thickness, conservation, etc.

2. All motors rated greater than 1000 watts shall have a power factor of not less than 85% under rated load conditions. Power factor of less than 85% shall be corrected to at least 90% under rated load conditions.

   a. For motors up to and including 50 Horsepower, the manufacturer shall provide motors with a power factor of not less than 85%. If this is not possible, then the manufacturer shall provide and install Power Factor corrective devices to comply with this Code.

   b. Motors larger than 50 Horsepower with starters furnished by the Electrical Contractor will have Power Factor corrective devices furnished and installed by the Electrical Contractor.

   c. On all Package equipment where starters are provided with the equipment such as chillers, heat pumps, rooftop units, etc., the manufacturer will be responsible for providing and installing Power Factor corrective devices to comply with this Code.

   d. Where power factor corrective devices are installed, they shall comply in all respects to the latest edition of the National Electrical Code.

L. UTILITIES

1. The Contractor shall investigate and locate all utilities prior to construction.

2. Each Contractor is responsible for rerouting or replacing existing utilities where necessary to permit installation of his work.

-confirm application-

3. The identity and location of the existing underground utilities known to be located in the construction area have been shown on the plans as accurately as provided by available documentation and field investigation. The owner's representative assumes no responsibility as to the accuracy of the underground elements shown on the plans.

4. The Contractor shall cause notice to be given to the underground utilities protection service and to the owners of underground utilities shown on the plans who are not members of a registered underground protection service in accordance with Code and local construction ordinances. The above mentioned notice shall be given at least 48 hours, excluding Saturdays, Sundays and legal holidays, and response confirmed prior to commencing work.

5. The Contractor shall immediately alert the occupants of nearby premises as to any emergency or impairment to service that he may create or discover in regard to underground utilities.

M. OPERATING AND MAINTENANCE INSTRUCTIONS

1. This Contractor shall thoroughly instruct and supervise the Owner's Maintenance Personnel in the proper operation and maintenance of the fire protection system equipment. This Contractor shall be responsible for arranging and scheduling the instruction and supervision, and for notifying the owner's representative at least 48 hours in advance.

2. Instructions shall include the following:

a. Location of equipment and explanation of what it does.

b. Reference to "Operating Instruction Manuals" for record and clarity.

c. Coordination of written and verbal instruction so that each is understood by all personnel.

d. Specific maintenance to be performed by Owner.

3. This Contractor shall furnish three (3) copies of the printed Operating and Maintenance Instructions for the Fire Protection Systems to the Owner's Representative for review. Each copy shall be neat, legible and bound in a hard back 3-ring notebook. Instructions shall consist of the following items:

   a. Title Page; date of submittal, project title, project address; & the name, address and telephone number of the Contractor, the Owner's Representative & the Engineer.

   b. Second Page; Index of Manual Contents.

   c. Third Section; Routine and 24-hour emergency information:

      1. Name, address and telephone number of servicing agency.

      2. Include names of personnel to be contacted for service arrangements.

   d. Fourth Section; A copy of each approved & corrected submittal with an index at the beginning of the section.

   e. Fifth Section; A list of all equipment used on the project, together with supplier's name and address.

   f. Sixth Section; Manufacturer's maintenance manuals for each item of equipment furnished under this Contract. Manuals shall include such items as parts lists, detailed service instructions, procedures for performing normal maintenance & service functions, preliminary trouble shooting procedures and wiring diagrams. Wiring diagrams to be as actually wired including control and interlock wiring.

   g. Seventh Section; copies of the valve & equipment identification schedules noted in "VALVE TAGGING AND PIPING IDENTIFICATION" & "EQUIPMENT IDENTIFICATION" specification sections.

   h. Eighth Section; Copy of Warranty/Guarantee Letter.

   i. Ninth Section; Copy of all documented fire protection systems testing, inspection, adjustment & certification reports.

   j. Tenth Section; Copy of all observation reports indicating confirmed compliance with all action items listed.

   k. Eleventh Section; Provide an electronic data copy of the corrected & up to date Record Documents drawings. Approved data format

(PDF, ACAD drawing file, etc.) & media format (CD, DVD, etc.) to be confirmed with the owner's representative.

N. RECORD DOCUMENTS

1. The Contractor shall keep an accurate record of all deviations from Contract Drawings and Specifications. He shall neatly and correctly enter in colored pencil any deviations on Drawings affected and shall keep the Drawings available for inspection. Extra sets of Drawings will be furnished for this purpose.

2. At the completion of project and before final approval, make any final corrections to Drawings and certify to the accuracy of each print by signature and deliver same to the owner's representative.

O. SUPERVISION

1. This Contractor shall have in charge of the work, on the job during construction, a competent superintendent experienced in the work installed under this Contract.

P. UNACCEPTABLE WORK AND OBSERVATION REPORTS

1. Work shall be unacceptable when found to be defective or contrary to the Plans, Specifications, Codes specified or accepted standards of good workmanship.

2. The Contractor shall promptly correct all work found unacceptable by the owner's representative whether observed before or after substantial completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such unacceptable work.

3. During the course of construction, the owner's representative will prepare and issue "Observation Reports" including a list of items found to be in need of correction. All action items listed shall be corrected by the Contractor. A space is provided on the form for the Contractor to note the completion of each item. All prior "Observation Report" items must be completed, the lists signed and returned to the owner's representative prior to making the final inspection. After the final list is issued, the same procedure will apply.

Q. FINAL INSPECTION

1. When the Contractor determines all work is completed and working properly per the Contract Documents, he shall request a "final" inspection by the owner's representative in accordance with general conditions requirements. If more than one re-inspection is required after this final inspection, the Contractor shall bear all additional costs including compensation for the owner's representative's additional services made

necessary thereby. A final inspection will not be made until Operating and Maintenance Manuals have been submitted and approved, and all outstanding "Observation Report" action items completed, confirmed, signed and returned to the owner's representative.

R. GUARANTEE

1. This Contractor is responsible for all defects, repairs and replacements in materials and workmanship, for a period of one (1) year after final payment is approved by the owner's representative. Provide a letter to this effect in the operations & maintenance manual.

S. PERMITS AND FEES

1. Unless directed otherwise by the General Conditions portion of project documentation, the Fire Protection Contractor shall apply for and pay any review, inspection, permit, license, testing and/or other service fees required by all review/inspection/approval authorities in connection with the work under this Contract.
2. Unless directed otherwise by the General Conditions portion of project documentation, the Fire Protection Contractor shall apply for and pay any procurement, tap, capacity, metering, testing and/or other service fees required by all Utility Providers (Water, Sewer, etc.) in connection with the work under this Contract. This shall include procurement, execution and return of any forms and/or applications required; and participation in individual, initial design/installation consultations with the providers if required.

3. The Fire Protection Contractor shall include in his Bid the cost for the water flow test required for preparation of hydraulic calculations. The flow test is to be arranged with the Water Authority by the FP contractor, performed and documented per their direction. The Owner's Representative shall be notified in advance of the test to allow the opportunity for observation. On completion of the test, copies of the documented results shall be included with the required hydraulic design calculations, and provided to the Owner's Representative for record.

4. The Fire Protection Contractor shall include in his Bid the cost for the preparation of FP construction document layout plans and hydraulic design calculations required for review and approval..

T. Protect all fixtures, equipment, piping & other elements installed in this contract against damage from any cause whatsoever and pay the cost of cleaning, replacing and/or repairing of same made necessary by failure to provide suitable protection.

1.04 DESIGN

A. The Contractor is required to read the Specifications covering all branches of the work and will be held responsible for coordination of his work with work performed under all other Contracts.

B. Sprinkler systems shall be designed, sized hydraulically and installed according to NFPA Pamphlet No. 13, and the rules and regulations of all review, inspection and approval authorities (required for final approval). See Plans for specific design information, including zoning, flow and density, allowances and head spacing.

C. Sprinkler systems modifications and revisions shall be according to NFPA Pamphlet No. 13, and the rules and regulations of all review, inspection and approval authorities (required for final approval). See Plans for specific design information, including zoning, flow and density, allowances and head spacing.

G. Standpipes and fire department hose connection system modifications and revisions shall be according to NFPA Pamphlet No. 14, and the rules and regulations of all review, inspection and approval authorities (required for final approval). See plans for specific installation information, including flow and pressure requirements.

K. The Private Site Fire Protection Water service shall be installed according to NFPA Pamphlet No. 24, and the rules and regulations of all review, inspection and approval authorities (required for final approval). See plans for specific installation information, including routing and location of items/elements.

O. If the Contractor has any questions concerning the Plans and Specifications, he is to feel free to contact the Engineer for clarification before Bids, and to fully understand the extent and responsibilities of his work.

P. Unless indicated otherwise at specific areas and/or locations, location of all sprinkler heads shall be determined by the Fire Protection Contractor, as required for protection specified, and final approval.

Q. All sprinkler heads to be aligned in respect to each other and building structural elements to present a uniform, even appearance.

R. The Fire Protection Contractor is responsible for centering all sprinkler heads in the center of all lay-in ceiling grid tiles, plus or minus 1 inch.

S. The Fire Protection Contractor is responsible for locating all sprinkler heads in one of the optional ceiling tile installation points as detailed on drawings for gridded lay-in ceilings.

T. The Fire Protection contractor shall refer to Architectural Reflected Ceiling Plans for locations of sprinkler heads at specific areas indicated. Relocation of these heads (if required), is subject to approval by the Architect.

U. Location of sprinkler heads by the Fire Protection Contractor is subject to approval by the Architect/Owner's Representative in review of the "Preliminary" Plans Submittal specified herein. The Architect/Engineer/Owner's Representative reserves the right to relocate heads during this review, providing sprinkler protection is not compromised, and no conflicts occur with NFPA or inspection/approval authorities requirements as a result of relocations.

1.05 FIRE PROTECTION SUPPLEMENTAL INFORMATION

- EXAMPLE, PROVIDE SPECIFIC INFORMATION FOR PROJECT CONDITIONS -

A. Water Source and Supply:

1. Connection to existing Fire Protection water main within the building structure at location indicated on plans.

B. Building Information:

1. See Architectural Documentation for detailed building code, occupancy classification(s) and construction information.

2. See complete Architectural documentation, including plans, elevations, sections and details for additional information affecting fire protection work.

1.06 TESTING AND INSPECTION

A. Testing:

1. Sprinkler Installation: The testing of the sprinkler installation shall conform to the applicable provisions of NFPA Pamphlet No. 13.

2. Standpipe Installation: The testing of the standpipe installation shall conform to the applicable provisions of NFPA Pamphlet No. 14.

7. Upon completion, and prior to the acceptance of the installation, the Contractor shall furnish the Owner with four (4) copies of the certification required. Testing of all piping for the Fire Protection system is to be made in accordance with the National Fire Protection Association and in the presence of a representative of the Owner and Insurance Company. As a minimum, a copy of "Contractors Certificate of Materials and Tests" properly executed and verifying satisfactory tests shall be furnished to the Owner upon completion of the tests.

B. Inspection: When all work has been completed, the Contractor shall conduct a preliminary but complete inspection and testing of the installation. The system, as a whole, and all component parts thereof, shall receive all inspections and tests necessary to assure that the materials, equipment, devices and all

functional operations meet the requirements of this specification and standards referenced herein.

C. The Owner's Representative shall be notified of all scheduled tests at least 48 hours in advance so that he may witness same. If the Contractor performs any test or adjustment without the Owner's Representative present or without properly notifying the Owner's Representative, the Contractor will be required to perform the test or adjustment a second time in the presence of the Owner's Representative.

1.07 COORDINATION

A. All work shall be done in a neat and workmanlike manner and this Contractor shall coordinate his work with all other Contractors on the project to ensure that his work does not interfere with the proper installation of work by other trades. This shall include full participation in preparation of construction coordination drawings in the format indicated by the owner's representative.

1.08 FIRE PROTECTION PLANS AND CALCULATIONS

A. Prepare plans and calculations indicating modifications and revisions to existing fire protection systems for review and approval by the Owner's Representative, the Insuring Agency and the review/inspection/approval authorities. Requirement of hydraulic calculations is at the discretion of the listed review, inspection and approval authorities, as confirmed by the Fire Protection Contractor. As a minimum, a revised fire protection layout plan for the remodeled/revised area(s) indicating new work and any modifications to existing elements shall be provided by the Fire Protection Contractor.

B. Submit four (4) sets of plans and calculations to the Owner's Representative for "Preliminary" review. The Fire Protection Contractor shall address all comments generated by this review to the satisfaction of the Owner's Representative, prior to submittal to the inspection/approval authorities.

C. Submit <three (3)> sets of plans and calculations to the Insurer for "Preliminary" review. The Fire Protection Contractor shall address all comments generated by this review to the satisfaction of the insurer, prior to submittal to the inspection/approval authorities.

D. After plans and calculations have been reviewed and approved for construction by the review/inspection/approval authorities, provide four (4) sets of the documentation with all required stamps and approvals to the Owner's Representative for "Final" review and record.

E. If applicable, wiring diagrams for all items included in the fire protection system shall be submitted for review, along with equipment submittals, plans and calculations. This includes manufacturer's standard diagrams for pre-wired items/elements such as tamper and flow switches, as well as any custom configured items/elements such as detection/control panels.

1.09 SUPERVISION

A. This Contractor shall have in charge of the work, on the job as required, during construction, a competent superintendent experienced in the work installed under this Contract.

1.10 BUILDING AUTHORITIES REVIEW & INSPECTION

A. The Contractor is responsible for arranging & scheduling required construction reviews & inspections with the Building Authorities, including on-going inspections at code specified stages of construction as well as final inspection.

B. The Contractor is responsible for compliance with all Building Authorities review and inspection directives in regard to methods of installation code compliance, including appropriate types & uses of materials, equipment & other elements specified.

C. The Contractor is responsible for satisfactorily addressing all specific Building Authorites concerns & comments generated by their review & inspection in regard to methods of installation code compliance, including appropriate types & uses of materials, equipment & other elements specified. This shall include response to the Building Authorities in writing if necessary, with copies to the owner's representative.

D. When the work is completed, the Contractor shall furnish the owner's representative a Certificate of Final Inspection and Approval from the Building Authorities for the Fire Protection Systems installation as required for project closeout.

PART 2 PRODUCTS

2.01 GENERAL

A. Where items/elements are indicated herein to be listed/approved, the intent of this specification is that said item/element shall be listed by all applicable material/construction standards and subject to final approval (including methods of installation) by all review/inspection/approval authorities.

B. Unless indicated otherwise, all Fire Protection contract items/elements (pipe, fittings, valves, specialties, fixtures, equipment, etc.) materials, construction, performance, testing and methods of installation to be as listed/approved by all applicable material/construction/installation standards for same, and be in accordance with the requirements of all review/inspection/approval authorities. This includes, but is not limited to, the standards and authorities referenced in this specification. In the absence of such standards and/or requirements, the item/element manufacturer's recommendations, as confirmed by the Fire Protection Contractor in advance, shall be followed.

C. Unless indicated otherwise, all piping shall be in accordance with the following standards in regard to materials, construction, dimensions/tolerances, type of service/transmission medium (water, air, gas, etc,) and methods of installation (as applicable), and shall be so listed. Final approval for use is subject to the requirements of the review and inspection authorities:

1. Steel and CPVC pipe, steel, CPVC, malleable and cast iron fittings and joining methods; per applicable ASTM/ANSI/ASME standards. In addition, where utilized for potable water service, all elements shall be per applicable NSF and ASTM A53 (for carbon steel) standards.

2. Copper/copper alloy/brass pipe/tube, fittings and joining methods; per applicable ASTM/ANSI/ASME standards. In addition, where utilized for potable water service, all elements shall be per applicable NSF standards.

D. All items/elements shall have the manufacturer's mark or name and the quality of the product or identification of same cast, embossed, stamped or indelibly marked on each item/element in accordance with the standards under which they are accepted and approved per applicable code(s).

E. Connections to existing building utilities shall be made with approved materials of the same type as, or listed for compatibility with, existing materials. Material types to be verified by this contractor in the field in advance of work.

2.02 PRE-BID EQUIPMENT

A. Model and Cost

1. The costs for the Pre-Bid items shall be included in this Contractor's Bid as an assigned cost. The purchase orders shall be transferred to this Contractor's name once contracts are signed. The costs and manufacturer's name and model numbers are as follows:

- Example -

a. Fire Pump - Acme Model no. FP-100
Cost - $10,000.00

b. Manufacturer’s Representative – John Doe; telephone no. 555-1111

PART 3 EXECUTION

3.01 GENERAL

A. Where standards, codes or guidelines are referenced herein and throughout the Fire Protection Contract documentation, including plans and specifications, the latest version/edition shall be applied, unless the Building Code references another version/edition, which shall take precedence.

B. Refer to project documentation furnished with the complete construction package in advance of work for overall coordination and verification of requirements at work of other trades relating to, interfacing with, and/or impacting work in the Fire Protection Contract. This includes exact locations, quantities, physical sizes, rough-in details, pipe routing, connection sizes, etc., for items included both in the Fire Protection Contract and under separate contract. Coordinate installation and interface requirements with the appropriate contractor(s) in advance of work.

C. Include any minor details, items and/or elements essential to necessary approvals and successful operation in addition to the items specified herein and shown on plans.

D. Where existing items/elements are indicated to be reused as a part of new work, the Fire Protection Contractor is responsible for action required to assure that such items/elements will function properly in the completed revised setting, and be in compliance with the requirements of the review, inspection and approval authorities. This includes removal, cleaning and/or reconditioning of items/elements if required.

E. See general "FIRE PROTECTION NOTES" on plans for additional conditions and requirements relative to the Fire Protection Contract.

F. Fire Protection items and elements shall be installed with due regard to preservation of the strength of structural members and prevention of damage to walls, surfaces and other structures through installation, bearing support or subsequent usage of Fire Protection items and elements. No framing or other support structure shall be cut, notched or bored in excess of limitations specified in the Building Code, or by the manufacturer of the framing or other support structure, as confirmed in advance of work by the Fire Protection Contractor.

3.02 EQUIPMENT

A. All equipment in this contract that includes drive motors, controls, electronic supervision and/or alarms (water heaters, pumps, compressors, etc.) shall be:

1. Tested for proper operation by the manufacturer in advance of shipment with appropriate certification provided on delivery. Packaged equipment shall be tested by the manufacturer as a complete assembly. This certification shall be included in the operations & maintenance package provided to the owner on project closeout.

2. Reviewed & approved for proper installation by the manufacturer’s authorized representative once installation is complete by this contractor, and in advance of start-up or operation.

3. Activated, started-up & operated/run by or under the direct supervision of the manufacturer’s field representative on-site, including any & all necessary adjustments, settings & calibrations required for proper operation & service as specified. Upon successful completion of this

process the manufacturer's representative shall provide certification of same. This certification shall be included in the operations & maintenance package provided to the owner on project closeout.

3.03 COMMISSIONING

A. This contractor shall install & test all fire protection systems, equipment, piping & components thereof in accordance with the requirements of all code & regulatory agencies, equipment manufacturer's recommendations & good engineering practices, ready for independent third party review & commissioning arranged & paid for by the owner. If any element or portion of the installation is found not to be in compliance with said requirements by the commissioning agency this contractor shall make necessary corrections at

3.04 INSTALLATION OF PIPING

A. All piping systems shall be installed with adequate provisions made to prevent stresses on piping, valves and equipment.

B. Provide unions or flanges at each final connection, and at each piece of equipment. Branches from mains to equipment stubs, risers, etc., to have swing joints with at least one change of direction in the horizontal plane and one change of direction in the vertical plane before connecting to equipment or fixtures. Piping shall be arranged and unions and flanges located to permit easy removal of parts and equipment for inspection and cleaning without disconnecting any part except unions or flanges. No welded connections shall be made to valves or equipment. Use bronze unions in copper lines. Pipe unions to be on equipment side of isolation valves.

C. Provide unions or flanges at each screwed valve, final connection, and at each piece of equipment. Branches from mains to equipment stubs, risers, etc., to have swing joints with at least one change of direction in the horizontal plane and one change of direction in the vertical plane before connecting to equipment or fixtures. Piping shall be arranged and unions and flanges located to permit easy removal of valves, parts, and equipment for inspection and cleaning without disconnecting any part except unions or flanges. No welded connections shall be made to valves or equipment. Use bronze unions in copper lines. Pipe unions to be on equipment side of isolation valves.

D. Flange bolts shall be cut to proper length so that one thread projects beyond the nut when nut and bolt are tightened.

E. Make proper connections to all items of equipment in the Contract as recommended by the Manufacturer or as detailed on the Drawings.

F. All piping shall be arranged in accordance with the best standards of the trade with vertical pipes plumb and horizontal runs parallel or perpendicular to the building wall.

G. Provide valves and specialties where indicated on the Drawings.

H. Ream ends of pipe and clean before installing.

I. All joints in copper piping shall be made with certified/listed “lead-free” solder materials. Solder materials containing lead are prohibited.

J. All joints in underground copper piping shall be brazed.

K. Use pipe dope on male threads of screwed pipe only. Teflon pipe joint tape may be used, at the Contractor's option.

L. Valves to be installed with hand-wheel at or above center of pipe. Valves outdoors exposed to weather shall be installed with hand-wheel in the horizontal.

M. Make all changes of direction with fittings, rather than bending.

N. Flanged joints shall be faced true and square. Flanges shall be same face style as mating surface to which it is connected.

O. All valves and unions to be installed so as to be accessible through ceiling, access panels, etc.

P. Where piping is installed in accessible chases, keep all piping to sides of chase, except portions which must necessarily be in center of chase.

Q. Provide dielectric unions or insulating flanges between dissimilar metals, i.e., copper to steel.

S. Where pipe drops occur in block walls, pipes to enter and leave walls at block joints. Coordinate with General Contractor. Whenever possible, pipe drops in walls to be a single length of pipe or tubing with no or minimal fittings.

T. Install galvanized sheet metal troughs with drains under pipes crossing electrical equipment. Seal to make water tight and provide pan drain to discharge at an approved location. See plumbing notes on plans for additional detail.

U. At the end of each day's work and otherwise as required or directed, provide caps and/or plugs at all openings in piping for protection. Particular attention must be given to avoid the possibility of any foreign materials entering the pipes during on-going construction, whether it be inadvertent or with malicious intent.

3.05 PROTECTION & CLEANING

A. After all equipment has been set it shall be thoroughly cleaned, removing all stickers, rust stains and other foreign matter and leave every part in acceptable condition, clean and ready for use.

B. After all piping & equipment has been approved and after all plastering has been completed, piping (with & without cover) & equipment provided under this Contract shall be thoroughly cleaned of dirt, debris, grease, rust, oil & any other foreign matter and primed (where necessary), ready for painting.

C. Repair all dents and scratches in factory prime or finish coats on all equipment, including plumbing fixtures, to the satisfaction of the Owner's Representative. If damage is excessive, replacement may be required.

D. Flush out all piping systems to remove all dirt, debris, grease and any other foreign matter from pipes and equipment before systems are placed in operation. Clean strainers after each flushing until the strainer remains clean.

E. Cover all equipment, motors, pumps, open pipes, etc., to keep out dirt, debris, water, weather and any other foreign matter during construction.

F. This Contractor shall clean up and remove all debris from the site on a daily basis and shall at all times keep the premises in a neat and orderly condition.

3.06 PRE-BID EQUIPMENT

A. Coordination

1. Since this Contractor shall assume installation, start-up and warranty responsibilities, he shall verify with the supplier exactly what was quoted to the Owner. No plea of ignorance of the original agreement will be accepted as a basis for any claims whatsoever for extra compensation.

End of Section

SECTION 21 05 10

FIRE-STOPPING

PART 1 GENERAL

1.01 SCOPE

A. This Contractor shall be responsible for fire-stopping at all penetrations of rated structures by work in this contract. Fire-stopping shall be performed by an installer who has been trained & certified by a listed Fire-stopping products manufacturer in the published UL systems installation procedures. Location, rating & specific details of rated structures to be as indicated by the architectural portion of the complete construction documentation set.

B. Fire-stopping is defined as materials or combination of materials used to retain integrity of fire and/or smoke rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in rated structures including walls & floors.

C. Test Requirements:

1. ASTM E-814, "Standard Method of Fire Tests of Through Penetration Fire Stops".

2. ASTM E-84, Standard Test Method for Surface Burning Characteristics of Building Materials.

3. International Fire-stop Council Guidelines for Evaluating Fire-stop Systems Engineering Judgments.

4. Underwriters Laboratories (UL) of Northbrook, IL runs ASTM E-814 under their designation of UL 1479 and publishes the results in their "FIRE RESISTANCE DIRECTORY" that is updated annually.

a. UL Fire Resistance Directory:

i. Through-Penetration Fire-stop Devices (XHCR)
ii. Fire Resistance Ratings (BXUV)
iii. Through-Penetration Fire-stop Systems (XHEZ)
iv. Fill, Voids, or Cavity Material (XHHW)
v. Forming Materials (XHKU)

5. QUALITY ASSURANCE

a. A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of fire-stop systems to train

appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

b. Fire-Stop System installation must meet requirements of ASTM E-814 or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated.

c. Proposed fire-stop materials and methods shall conform to applicable governing codes having local jurisdiction.

d. Fire-stop systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

e. For those fire-stop applications that exist for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment drawings must follow requirements set forth by the International Fire-stop Council.

6. SUBMITTALS

a. Submit Product Data: Manufacturer’s specifications and technical data for each material including the composition and limitations, documentation of UL fire-stop systems to be used and manufacturer's installation instructions.

b. Manufacturer's engineering judgment identification number and drawing details when no UL system is available for an application. Engineer judgment must include both project name and contractor’s name who will install fire-stop system as described in drawing.

c. Submit material safety data sheets provided with product delivered to job-site.

7. INSTALLER QUALIFICATIONS

a. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the fire-stopping manufacturer as having been provided the necessary training to install manufacturer’s products per specified requirements. A manufacturer’s willingness to sell its fire-stopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

8. DELIVERY, STORAGE, AND HANDLING

a. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

b. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

c. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.

d. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

e. Do not use damaged or expired materials.

9. PROJECT CONDITIONS

a. Do not use materials that contain flammable solvents.

b. Scheduling

i. Schedule installation of CAST IN PLACE fire-stop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.

ii. Schedule installation of other fire-stopping materials after completion of penetrating item installation but prior to covering or concealing of openings.

c. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

d. Weather conditions: Do not proceed with installation of fire-stop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

e. During installation, provide masking and drop cloths to prevent fire-stopping materials from contaminating any adjacent surfaces.

PART 2 PRODUCTS

2.01 GENERAL

A. Provide fire-stopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the fire-

stopping under conditions of service and application, as demonstrated by the fire-stopping manufacturer based on testing and field experience.

B. Provide components for each fire-stopping system that is needed to install fill material. Use only components specified by the fire-stopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

2.02 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with through penetration fire-stop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:

1. Hilti, Inc., Tulsa, Oklahoma, (800)879-8000
2. Tremco Sealants & Coatings, Beachwood, Ohio, (216) 292-5000
3. 3M Fire Protection Products, St. Paul, Minnesota, (612) 736-0203
4. Specified Technologies Inc., Somerville, New Jersey, (800) 992-1180
5. Nelson Fire-stop Products, Tulsa, Oklahoma, (918) 641-7299
6. Fox Couplings, Inc., Jacksonville, Florida, (904) 396-2865
7. Proset Systems Inc., Lawrenceville, Georgia, (800) 262-5355
8. Equivalent products listed in the UL Fire Resistance Directory – Volume 2

2.03 MATERIALS

A. Use only fire-stop products that have been UL 1479, ASTM E-814 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Cast-in place fire-stop devices are installed prior to concrete placement for use with non-combustible and combustible plastic pipe (closed and open piping systems) penetrating concrete floors, the following products are acceptable:

1. Hilti CP 680 Cast-In Place Fire-stop Device
2. Fox Coupling, Inc. "Cast-In-Place Fire-stop Coupling".
3. Proset Cast-In-Place Device
4. Equivalent products listed in the UL Fire Resistance Directory – Volume 2

C. Sealant or caulking materials for use with non-combustible items including steel pipe & copper pipe, the following products are acceptable:

1. Hilti FS-ONE Intumescent Fire-stop Sealant
2. 3M Fire Barrier CP25 or Fire-stop Sealant 2000
3. Tremco Fyre Shield
4. STI LC Latex Endothermic Sealant and SSS Intumescent Sealant
5. Nelson LBS Sealant
6. Equivalent products listed in the UL Fire Resistance Directory – Volume 2

D. Intumescent sealant or caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe and plastic pipe, the following products are acceptable:

1. Hilti FS-ONE Intumescent Fire-stop Sealant
2. 3M Fire Barrier CP25WB+
3. Tremco Intumescent Acrylic or TremStop WBM
4. STI SSS Intumescent Sealant
5. Nelson LBS Sealant
6. Equivalent products listed in the UL Fire Resistance Directory – Volume 2

E. Fire-stop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:

1. Hilti CP 642 and CP643 Fire-stop Collar, CP645 Wrap Strip
2. Tremco TREMstop D Combustible Pipe Intumescent Device System and TremStop WS Wrap Strip
3. 3M Ultra Plastic Pipe Device and Fire Barrier FS-195+ Wrap Strip
4. STI SSC Fire-stop Collars and Intumescent SSW Wrap Strip
5. Nelson PCS Plastic Pipe Choke System and WRS Wrap Strip
6. Equivalent products listed in the UL Fire Resistance Directory – Volume 2

F. Materials used for large size/complex penetrations made to accommodate multiple steel and copper pipes, the following products are acceptable:

1. Hilti FS 635 Trowel-able Fire-stop Compound and FS 657 FIRE BLOCK
2. Tremco TremStop M Fire Rated Mortar and PS Pillows
3. 3M Fire Barrier CS-195+ Composite Sheet
4. STI SSM Fire Rated Mortar and SSB Fire-stop Pillows
5. Nelson CMP Fire-stop Compound and PLW Fire-stop Pillows
6. Equivalent products listed in the UL Fire Resistance Directory – Volume 2

G. Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate multiple steel and copper pipes, the following products are acceptable:

1. Hilti FS 657 FIRE BLOCK
2. Tremco PS Fire-stop Pillows
3. 3M CS Intumescent Sheet
4. STI SSB Fire-stop Pillows
5. Nelson PLW Fire-stop Pillows
6. Equivalent products listed in the UL Fire Resistance Directory – Volume 2

H. Provide a fire-stop system with an "F" Rating as determined by UL 1479 or ASTM E814. The F rating must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated.

PART 3 EXECUTION

3.01 PREPARATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify penetrations are properly sized and in suitable condition for application of materials.

2. Surfaces to which fire-stop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by fire-stopping materials.

4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of fire-stopping.

5. Do not proceed until unsatisfactory conditions have been corrected.

3.02 COORDINATION

A. Coordinate location and proper selection of cast-in-place fire-stop assemblies with the trade responsible for the associated structure. Ensure fire-stop assembly is set in framing at the proper location & secured in place prior to construction.

B. Responsible trade to provide adequate spacing of field run pipes to allow for installation of cast-in-place fire-stop devices without interferences.

3.03 INSTALLATION

A. Regulatory Requirements: Install fire-stop materials in accordance with UL Fire Resistance Directory.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration joint materials.

C. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

D. Protect materials from damage on surfaces subjected to traffic.

3.04 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities.

C. Perform under this section patching and repairing of fire-stopping caused by cutting or penetrating of existing fire-stop systems already installed by other trades.

3.05 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed holes and joints to be free of excess fire-stop materials and soiling as work progresses.

END OF SECTION

SECTION 21 05 11

VALVES

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install all necessary valves for piping systems and equipment in the building required to provide proper shut off and control of systems included under this Contract.

B. Where valves are installed in potable domestic water piping they shall be listed for such service and in compliance with plumbing code materials and construction requirements.

C. Furnish & install access doors for piping specialties installed within or behind fixed structures such as drywall, plaster, qypsum, concrete, brick, etc. as required for access, maintenance & operation.

PART 2 PRODUCTS

2.01 Gate and check valves shall be Watts, Mueller, Grinnell, Crane, Hammond, Jenkins, Milwaukee, Nibco, Powell or Stockham and shall all be by the same manufacturer.

2.02 Ball valves shall be as manufactured by Apollo or any of the manufacturers listed herein for gate and check valves.

2.03 Butterfly valves shall be as manufactured by Keystone, Center Line or any of the manufacturer's listed herein for gate and check valves.

2.04 Each type of valve (gate, ball, check, etc.) to be by a single listed manufacturer when available.

2.05 All fire protection shut-off valves shall be listed indicating type.

2.06 All valves not accessible for operation with a standard 7 foot ladder or in obstructed/restricted access locations shall be provided with remote chain operators.

2.07 Where control valves are provided for piping installation including insulation cover they shall be provided with extensions by the valve manufacturer as required for un-restricted full range operation without damage to the insulation.

2.08 GATE VALVES

A. 3" and larger - iron body, bronze mounted, O.S.&Y., flanged, taper solid wedge disc, rising stem, 125 lb. S.W.P.

B. 2-1/2" and smaller - all bronze industrial grade type with threaded connections, tapered solid wedge disc, union bonnet & rising stem.

C. At the Contractor's option, gate or ball valves 2" and smaller may be "Butterball" butterfly valves Style BB1-100, bronze body with threaded ends, lever handle, stainless steel disc and stem, rated for 175 lb. W.O.G.

D. Where gate valves 2-1/2” size and smaller are indicated on plans, the Contractor has the option to provide ball valves as specified herein. Where ball valves are indicated, they are to be provided as specified herein; no options allowed.

E. Where gate valves 3” and larger are indicated on plans, the Contractor has the option to provide butterfly valves as specified herein. Where butterfly valves are indicated, they are to be provided as specified herein; no options allowed.

2.09 BALL VALVES

A. 2-1/2" size and smaller shall be two-piece bronze body ball valve with threaded connections, union connection body, teflon seats, conventional port, blowout proof stem, adjustable packing gland, chrome plated bronze ball, and lever handle labeled for service controlled. Rated for 150 psig SWP & 400 WOG.

B. Unless indicated otherwise, drain valves shall be bronze construction ball valves as specified herein.

2.11 BUTTERFLY VALVES

A. 2-1/2" to 20" size shall be cast or ductile iron valve. Furnish with lug pattern body, aluminum bronze disc, stainless steel stem, EPDM seat & positive shut-off at 175 psig W.O.G. (2-12") and 150 psig W.O.G. (14"-20").

B. When victaulic piping is specified and utilized, Victaulic Style 300 butterfly valves for piping 2" to 12" may be furnished at the Contractor's option.

2.12 CHECK VALVES

A. 3" and larger - iron body, bronze mounted, horizontal swing check with bronze disc, flanged, 125 lb. S.W.P.

B. 2-1/2" and smaller - all bronze, horizontal swing check with bronze or TFE disc, screwed, 125 lb. S.W.P.

C. Non-slam check valves at pumps only - 2-1/2" and larger shall be flanged, cast iron or semi-steel body, bronze trim, center guided lift check with bronze disc and stainless steel spring, 125 lb. S.W.P. 2" and smaller shall be screwed, bronze, cast iron or semi-steel body, bronze trim, center guided lift check with bronze or TFE disc and stainless steel or alloy spring, 125 lb. S.W.P.

E. Clow, McAlear, Mueller or Metraflex non-slam check valves are acceptable manufacturers as well as previously listed manufacturers.

F. When Victaulic piping is specified and utilized, Victaulic Style 711, 715, or 716 Check valves for piping 2" to 12" may be furnished at the Contractor's option.

2.13 All valves in fire protection applications to be listed for such service by the manufacturer.

2.14 Access Doors

A. Access doors, except in sheet metal, based on Milcor. Miami-Carey, Karp or Way "Locttor" access doors of the same type and size may be furnished at the Contractor's option.

B. Styles A, B or M will be installed to suit location and wall or ceiling finish.

C. Unless otherwise noted, ceiling access doors to be 12" x 24".

D. All doors shall be equipped with screwdriver operated catches.

E. Furnish access doors for access to mixing boxes above the ceiling, concealed steam drips, valves, air vents and elsewhere as required or shown.

2.15 Access Doors to be furnished & installed by this contractor in accordance with general contract specifications.

PART 3 EXECUTION

3.01 This Contractor shall install all valves in strict accordance to the manufacturer's recommendations.

3.02 Where drain lines are not piped to floor drains, furnish hose end adapters. Provide cap & chain for all hose end adapters.

3.03 Access doors to be located & installed to permit ready & un-obstructed access to associated valves, permitting full range of operation as well as service, maintenance & inspection.

3.04 Where a pressure regulator or reducing valve is indicated to be installed, an ASME listed pressure relief valve shall be installed in the downstream piping, set to relieve at 90 percent of the rated working pressure of the piping installation unless indicated otherwise.

END OF SECTION

SECTION 21 05 12

PIPING SPECIALTIES

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install all necessary piping specialties to include backflow preventors, gauges, pipe strainers, etc., for piping systems included under this Contract.

B. Furnish & install access doors for piping specialties installed within or behind fixed structures such as drywall, plaster, qypsum, concrete, brick, etc. as required for access, maintenance & operation.

PART 2 PRODUCTS

2.01 Pressure Gauges - Weiss 4PGA-l, standard single spring, aluminum case, 4-1/2" diameter with gauge cock and pigtail. Nominal 0 to 300 psig range unless indicated otherwise. Trerice, Marsh or Ashcroft of the same type may be furnished at the Contractor's option.

2.02 Altitude Gauges - Weiss Series AG-1, standard single spring, aluminum case, 4-1/2" diameter with gauge cock. Range as indicated. Trerice, Marsh or Ashcroft of the same type may be furnished at the Contractor's option.

2.03 Compound Gauges - Weiss 4PGA-l, standard single spring, aluminum case, 4-1/2" diameter, with gauge cock, range as indicated. Trerice, Marsh or Ashcroft of the same type may be furnished at the Contractor's option.

2.04 STRAINERS

A. All water lines - Sarco style IF- 125 (flanged) or IT (threaded) 125 psig, Y-pattern, cast iron body with perforated brass screen for water. Threaded for 2- 1/2" and smaller, flanged for 3" and larger.

B. Armstrong, Mueller, Metraflex, or O.C. Keckley strainers may be furnished at the Contractor's option.

2.05 Pressure reducing valve - similar to Elkhart No. UR-20- 2.5, listed/approved adjustable in-line body type 2 1/2" size, polished brass body, wheel handle. Female inlet and outlet, threaded connection, rated for 300 psig inlet pressure. Valve to be equipped with bracket and switch for supervisory alarm, and shall serve as a floor control valve. Pressure reducing valves as manufactured/provided by Powhatten, Potter Roemer, Elkhart, Guardian, Croker, Reliable, Viking, Grinnell, Automatic, Central or Victaulic may be furnished at the contractor's option.

2.09 Gate valves underground shall be ANSI/AWWA listed valve assemblies with iron body, bronze fittings, double disc non-rising-stem and square operating nut. Coordinate installation with curb box specified and the requirements of the Division of Water. Furnish with mechanical joint connections compatible with specified piping, rated for 175 psig working pressure.

2.10 Tapping sleeve and valve

A. Tapping sleeve shall be cast iron, split sleeve type, mechanical joints with oversize seat rings for tapping.

B. Valve - mechanical joint, iron body, bronze mounted, double disc, non- rising stem, with 2" square operating nut. Provide extension if required to locate operating nut approximately 2 feet below finish grade.

C. Tapping sleeve and valve shall conform to AWWA Standard C500 and local Water Department requirements.

D. Clow, Mueller, Hayes or Ford may be furnished at the Contractor's option.

2.11 HOSE CONNECTIONS; as specified on plans.

A. Hose connections as manufactured/provided by Powhatten, Potter Roemer, Elkhart, Guardian, Croker, Reliable, Viking, Grinnell, Automatic, Central or Victaulic may be furnished at the contractor's option.

2.15 Wet pipe alarm valve – Reliable Model E, variable pressure with retarding chamber (for water motor alarm and electrical alarms) flow indicating pressure switch, valves, strainer, gauges, orifice restriction and pipe nipples and fittings. Extend sensing line to Reliable Model C water motor gong. Sensing line to be schedule 40 galvanized steel with class 125 galvanized iron fittings, size as recommended by valve manufacturer. Drip cup assembly and 2” main drain. Alarm valves as manufactured/provided by Reliable, Automatic, Central, Grinnell, Viking or Victaulic may be furnished at the Contractor’s option.

2.12 Fire hydrant materials of construction, manufacturer, type, connection threads and method of installation shall be in accordance with the requirements of the Division of Water, the Fire Department/Fire Prevention authority and NFPA pamphlet no. 24, including the following;

A. 6” mechanical joint inlet connection and two (2) 2 ½” outlet connections, break-away operator rod and operating nut. Provide a single 4” outlet connection if required by the referenced authorities. Provide caps and chains for outlet connections.

B. Provide watch valve with curb box at grade adjacent to hydrant. Anchor valve to hydrant tee.

C. Hydrants shall not be self draining type unless directed by the referenced authorities.

2.13 Wall mounted post indicator assembly – cast iron body with bronze and steel fittings. Assembly to be adjustable type provided with compatible flanged connector for attaching to non-rising-stem gate valve, indicator reading “OPEN” or “CLOSED”, extension section as required for wall thickness, and lockable wheel handle operator. Exterior assembly to be painted fire protection red. Provide chain and padlock with two (2) keys to the owner/user, and lock in the open position. Assembly to be tapped for supervisory alarm switch.

2.16 Inspector’s Test Connections – 1” Inspector’s Test Connections shall be installed as required per authorities having jurisdiction. Discharge shall run to open air unless indicated otherwise. All Inspector’s Test Connections to control valves shall be located and installed per the requirements of the local fire department, verified in advance by the Fire Protection Contractor. Provide metal tag connected to control valve bearing words, “INSPECTOR’S TEST.”

2.17 Contractor to furnish and install identification signage where required, similar to Reliable Model A. As a minimum, an engraved sign shall be provided at the main supply riser/control valve indicating basic design information.

2.19 ALARM INITIATING DEVICES

A. Gate valve supervisory switches - furnish and install listed/approved supervisory switches on all types of shut-off valves capable of interrupting flow in the Sprinkler System.

B. Flow switch – listed/approved vane-type water flow detector with pipe saddle connection fitting, U-bolt securing assembly, adjustable pneumatic retard to prevent false alarms and two (2) sets of form "C" contacts. Maximum pressure rating of 300 psig.

C. Alarm initiating devices as manufactured/provided by FCI, Notifier, Honeywell, Potter or any of the manufacturers listed for sprinkler equipment and accessories may be furnished at the contractor's option.

2.20 Access Doors

A. Access doors, except in sheet metal, based on Milcor. Miami-Carey, Karp or Way "Locttor" access doors of the same type and size may be furnished at the Contractor's option.

B. Styles A, B or M will be installed to suit location and wall or ceiling finish.

C. Unless otherwise noted, ceiling access doors to be 12" x 24".

D. All doors shall be equipped with screwdriver operated catches.

E. Furnish access doors for access to mixing boxes above the ceiling, concealed steam drips, valves, air vents and elsewhere as required or shown.

2.21 Access Doors to be furnished & installed by this contractor in accordance with general contract specifications.

PART 3 EXECUTION

3.01 All specialties to be installed in accordance with manufacturer's recommendations.

3.02 All gauges to be installed to be readable from floor without obstruction.

3.03 Backflow preventors to be installed with clearances & access in accordance with the inspecting authorities requirements & the recommendations of the manufacturer.

3.04 Access doors to be located & installed to permit ready & un-obstructed access to associated specialties, permitting full range of operation as well as service, maintenance & inspection.

END OF SECTION

SECTION 21 05 13

EXCAVATION & BACKFILL

PART 1 GENERAL

1.1 SCOPE

A. This Contractor shall excavate and backfill all trenches and other excavations required for installation of piping, pits, vaults, etc. associated with work in this contract.

B. All work shall conform to the safety requirements, rules and regulations for the construction authorities and regulatory agencies, including the Federal Register Sections on Safety and Health and OSHA.

PART 2 PRODUCTS

2.1 BACKFILL MATERIAL

A. Earth Fill: Soil as approved by Architect and Soils Engineer, free of organic soil, sod, roots, wood, metal, rubbish, debris, lumps or excessive amounts of clay and rocks greater than 2” in diameter; capable of being compacted into dense and stable condition as specified.

B. Granular Fill:

1. Structural:

a. Coarse: Bank-run sand and gravel having uniform mixture of sand and gravel, capable of being compacted into dense and stable condition as specified, and free of organic soil, shale, lumps or excessive amounts of clay, and other foreign substances. NOTE: 100% of material must pass 2" sieve and have less than 25% passing #200 sieve as approved by Soils Engineer.

b Fine: "6X" by American Aggregates; a finely graded crushed stone and stone by-product from approximately 3/8" to 10-20% passing the #200 sieve. Material to be of low solubility as approved by Soils Engineer.

2. Slab Sub-Base: Provide under all interior concrete slabs on grade.

a. ODOT 703, Size #304 crushed or uncrushed stone.

b Surface choke with sand or fines to prevent damage to vapor barrier.

3. Drainage: ODOT 703, Size #467, washed and uniformly graded mixture of uncrushed gravel, with 100% passing a 2-inch sieve, and not more than 5% passing a #4 sieve.

C. Under Footings and Foundations: Concrete.

D. Around underground concrete, fiberglass or plastic tanks and similar structures: Pea Gravel unless indicated otherwise by the equipment manufacturer.

E. Plastic Water Service Pipe. Soil free of large rocks, building materials, etc., that might cause damage to the plastic pipe.

PART 3 EXECUTION

3.1 EXCAVATION

A. Trench width shall be sufficient to permit proper installation of the pipe and bottom of trenches evenly graded to insure uniform bearing for pipe.

B. Trenches shall be sheathed or braced and pumping or bailing performed as necessary to protect workmen and adjacent structures and to permit proper execution of the work.

C. Bell and Spigot joint holes to be carefully excavated so that none of the load is supported by the bells or joints.

D. Mechanical excavation shall be held to 4" above final pipe elevation. The remainder shall be shaped by manual excavation, so that pipe is fully supported on undisturbed soil.

E. Excavations below required depths shall be refilled with sand or gravel firmly compacted. Rock encountered shall be excavated three inches (3") below the lowermost part of the pipe and the space so formed, refilled with sand and gravel well compacted. Refill shall be concrete under footings and foundations.

F. All lines below slab-on-grade floors to be bedded in coarse sand or pea gravel minimum 2" under pipe and 4" above.

G. Whenever in the opinion of the owner's representative the soil at or below grade is unsuitable for supporting piping, equipment, or other construction included under this Contract, such provisions for proper foundations shall be made, in addition to those shown or specified, as the owner's representative may direct. Equitable contract cost adjustment shall be provided in accordance with conditions encountered and additional provisions required.

3.2 TESTS AND INSPECTIONS

A. All required tests and inspections are to be approved by the Owner's Representative before any backfilling is done.

3.3 BACKFILLING

A. Backfill to rough grade within area of grading work required under General Contract, and to finish grade elsewhere.

B. Backfill shall be free of rubbish and boulders.

C. Tamp backfill in 6" layers to a point 24" above pipe; and 12" layers above this point. Backfill to be thoroughly compacted.

D. No frozen backfill shall be used.

E. Under footings and foundations, concrete backfill to extend one foot each side of footing or foundation.

F. Locations:

1. Under Building: Where additional excavation required or against footing sides where formed sides used; Granular, Fine Structural, to underside of slab sub-base.

2. Under All Interior Slabs: Provide 4" layer of slab sub-base; smooth and compact to specified density and leave ready for installation of vapor barrier.

3. Against Walls: Drainage fill.

4. Under Pavements:

a. Drives and Roads: Granular, Course Structural.

b. Walks: Granular, Course or Fine Structural.

5. Trenches: Granular, Fine Structural.

6. Site: Earth-Fill.

3.4 All pavements, curbs, walks and lawns damaged by this work shall be repaired by this Contractor to the original condition of same.

3.5 Protect all utilities shown on Drawings or encountered while doing work in this contract. Any damage to utilities shall be repaired by this Contractor to utility owner's satisfaction, without additional contract cost for this project.

3.7 This Contractor shall remove any unusable or surplus excavated material from site.

3.8 Confirm & comply with the published installation requirements of all piping manufacturer's installation recommendations.

END OF SECTION

SECTION 21 05 14

PAINTING

PART 1 GENERAL

1.01 SCOPE

A. All un-painted steel supports and other structures provided for work in this contract shall have a minimum single coat of base primer provided after installation is complete. Elements provided with a manufacturer applied corrosion resistant finish are not required to be painted unless the finish has been removed, damaged or otherwise compromised.

B. All exposed metallic piping at the building exterior or in areas other than that designated as mechanical or utility spaces shall have a minimum single coat of base primer provided after installation is complete.

B. Factory finished equipment & materials which have rusted or been damaged shall be cleaned at the completion of the project, including removal of rust spots and marred areas. These items shall be refinished and restored to the original finish condition.

PART 2 PRODUCTS

2.01 Primer shall be corrosion resistant epoxy base type listed for exterior applications in neutral gray or white color, and shall meet the applicable requirements of the general contract specifications for same including listing of acceptable manufacturers. Primer shall be listed for use with any & all materials it is applied to.

PART 3 EXECUTION

3.01 Elements to be painted to be cleaned & prepped in accordance with general contract specifications & the paint manufacturers recommendations in advance of application.

3.02 Coordinate & schedule application of primer with the general contractor when he is specified to provide finish painting.

END OF SECTION

SECTION 21 05 15

SLEEVES & COLLARS

PART 1 GENERAL

1.01 SCOPE

A. Sleeves shall be provided for all piping run through all new framed and/or poured/formed construction. Coordinate with fire-stopping requirements at all rated structures. This Contractor shall furnish sleeves for his work to the General Contractor for installation where directed, coordinated & scheduled in advance.

B. Sleeves are not required for openings core drilled through existing walls.

C. Finish collars/escutcheons shall be provided for all piping that penetrates structures (walls, ceilings, partitions, soffits, bulk-heads, floors, etc.) in “finished” areas accessible to the general building population.

PART 2 PRODUCTS

2.01 Sleeve material: black steel pipe, machine cut, large enough to allow l/4" clearance all around pipe (around pipe covering on insulated piping). Use machine cut copper sleeves for un-insulated copper pipe.

2.02 Sleeves passing through fire rated walls or floors to be in accordance with “FIRE-STOPPING” requirements listed herein.

2.03 Collars/escutcheons to be pipe friction-fit convex brass with a polished chrome finish.

PART 3 EXECUTION

3.01 Sleeves in partitions to have length equal to the thickness of finished partitions. Sleeves in floors of finished areas to project l/8" above finished floor. Sleeves in floors of non-finished areas shall project 3" above finished floor. Fill space between pipe and sleeves into exposed areas with sealing compound. Ream all sleeves before installing.

3.02 Sleeves in floors of all Mechanical/Electrical Rooms receiving a membrane floor to project 6" above floor to receive the membrane base.

3.03 Where pipes pass through fire rated walls or floors, sleeves shall comply with “FIRE-STOPPING” requirements listed herein.

3.04 Sleeves to be set in forms prior to pour in concrete structures; and in framing structure as partitions are being built.

3.05 Collars/escutcheons for pipe penetrations to be of adequate size to completely cover & conceal the rough wall opening & be final set tight to structure.

3.06 Cutting required of any masonry wall or floor after it is in place shall be done by core drilling.

3.07 Piping is not allowed to bear on sleeves.

3.08 Sleeves shall be installed plumb and true to line, grade, and position.

3.09 Unused sleeves shall be trimmed, plugged and finished to match adjacent surface.

END OF SECTION

SECTION 21 05 18

INSERTS, PIPE HANGERS & SUPPORTS

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install all necessary inserts, beam clamps and auxiliary steel for pipe hangers in the building.

B. Furnish and install necessary pipe hangers and supports to properly support all piping and to maintain uniform elevation.

C. Piping & equipment to be installed & supported in accordance with Building Code requirements applicable to the site seismic classification. This includes but is not limited to restraints, sway-bracing, isolation, etc. Seismic classification to be as indicated by project data included with the complete construction package.

D. The use of power-driven anchors is expressly prohibited. Power-driven anchors are defined as anchors which are driven into place by any device which produces an impact force by use of a powder charge, compressed air, gas, or other propellant.

E. Piping, equipment & other elements in this contract to be installed in strict accordance with the manufacturers' guidelines & recommendations for support, confirmed by the contractor in advance of all work.

F. Where non-ferrous piping is specified for installation, all hanger and support components shall also be of non-ferrous construction.

F. All hangers and supports for fire protection piping to be in accordance with the requirements of the NFPA pamphlets listed in section 21 00 00 – FIRE PROTECTION – GENERAL.

PART 2 PRODUCTS

2.01 HANGERS

A. Piping shall be adequately supported by means of hangers and supports, and be in compliance with NFPA Pamphlets 13 & 14 as applicable. Furnish required supplemental listed steel framing, bracing, etc. as necessary for support & stabilization.

B. The Following Items Shall Be Provided:

1. Supplementary channels, plates, etc. where supports are required between building structural members, spanning the space and attached to building structural members by welding or bolting.

2. All rods, angles, rails, struts, braces, plates, platforms, etc., required for suspension and/or support of piping, and all miscellaneous specialties and items/elements required for the attachment of hangers and supports to the structure.

C. Unless Otherwise Noted, Hangers Shall Be As Follows:

1. Piping 8” size and smaller, hanger shall be similar to Anvil Fig. 69, with adjustable nut and carbon steel band.

2. Hangers for copper lines 2" size and smaller shall be similar to Anvil Figure CT-99 adjustable carbon steel pipe ring with copper plating & support rod.

3. Hangers for direct attachment to copper lines 2-1/2" to 4" size shall be similar to Anvil Figure CT-65 adjustable carbon steel clevis with copper plating & support rod.

4. Hangers for direct attachment to copper lines 6" size & larger shall be similar to Anvil Figure 260 adjustable carbon steel clevis with dielectric sleeve/protection & support rod.

5. Hangers for non-ferrous piping shall be of a similar type/configuration to the steel components listed, except with all brass construction. This includes the hanger, insert, support rod, nuts and all other components.

2.02 Wall brackets to be similar to Anvil figure no. 195.

2.03 Riser clamps to be similar to Anvil figure no. 261. Clamps in direct contact with copper piping to be Anvil figure no. CT-121C with dielectric protection coating.

2.04 Hanger support rods to be listed all-thread type sized in accordance with the hanger manufacturer’s recommendations for associated piping.

2.05 Clamps & inserts to be listed assemblies provided by the hanger manufacturer for the corresponding support rod size.

2.06 Where steel hangers are installed at building exterior locations they are to be provided with a manufacturer applies corrosion resistant galvanized finish for the entire hanger assembly, including nuts, clamps and rods. This includes hangers installed at open parking areas, building overhangs and any other similar locations.

2.06 Hangers, supports & accessories as manufactured/provided by Anvil, B-Line, Michigan, PHD Manufacturing, Erico or Modern Pipe Hangers may be furnished at the Contractor's option.

PART 3 EXECUTION

3.01 Piping shall only be independently supported from building primary structure in an approved manner & in accordance with best construction practices. Piping shall not be supported from or bear on non-load bearing structures, equipment, fixtures, building elements, other piping, or work of other trades. Piping shall not be used as a support for any other elements.

3.02 Piping shall not be supported from or attached to any structure in such a manner as to compromise or weaken said structure. All structural attachment devices shall be listed for such service & installed in accordance with the manufacturer's guidelines & recommendations.

3.03 Pipe clamps shall be provided at each stack & riser structural floor penetration.

3.04 Wall bracket pipe supports shall be installed where required.

3.05 All copper piping is to be shielded from direct contact to steel or other corrosive reaction material of any type with approved dielectric protection.

3.06 Fire protection piping to be supported at intervals as specified in the NFPA pamphlets listed in section 21 00 00 – FIRE PROTECTION – GENERAL.

3.07 Support piping at pumps and equipment from floor, ceiling, or walls, so that piping weight is not supported directly from pumps or equipment.

3.08 Piping at equipment and control valves, etc. shall be supported so that those elements/items can be removed without providing additional support elements. Piping shall not introduce any strains or distortions on connected equipment.

3.09 All hangers shall be double-nutted.

END OF SECTION

SECTION 21 05 20

CUTTING & PATCHING

PART 1 GENERAL

1.01 SCOPE

A. Cutting for all openings in structures, framing or other elements required for installation of work in this contract shall be done by this contractor with appropriate tools and methods as to prevent unnecessary damage to surrounding areas or equipment.

B. Unless indicated otherwise patching for all openings left in structures after existing plumbing elements have been removed shall be done by this contractor to match adjacent structure in type, kind & finish.

PART 2 PRODUCTS

2.01 Patching & repair of structural elements to be done with listed compatible materials & methods in accordance with general contract conditions for specific types of structure when applicable.

PART 3 EXECUTION

3.01 Avoid cutting of concrete, masonry and other new work by the use of inserts and sleeves.

3.02 All holes in existing walls and floors shall be cut by use of core drills, using water to keep down the dust, and a method for catching water shall be provided. In addition, a vacuum cleaner shall be used with inlet as close to the hole being drilled as possible to pick up all dust caused by drilling.

3.03 The corners of all openings in poured concrete shall be core drilled to minimize over-cutting.

3.04 Fill and patch openings left by removal of piping and equipment in this contract to match adjacent surfaces.

3.05 Openings in rated structures shall be filled or patched in such a manner as to maintain the appropriate rating including fire-stopping if necessary.

3.06 The Protection of Persons and Property Section of the General Conditions must be followed without exception, including precautions against Fire Hazards.

3.07 No structural member will be cut without the expressed permission of the Owner's Representative obtained in advance.

END OF SECTION

SECTION 21 05 21

ELECTRICAL WORK

PART 1 GENERAL

1.01 SCOPE

A. This Contractor shall furnish all motors for his equipment. Motor starters, safety switches and wired junction boxes shall be furnished and installed by the Electrical Contractor except where specifically specified to be furnished with certain mechanical equipment.

B. WORK INCLUDED - This Contractor; all 120V & low voltage internal control wiring unless otherwise specified.

C. WORK INCLUDED - Electrical Contractor; all external power & building alarm wiring.

D. SHOP DRAWINGS; the Contractor shall furnish to the Electrical Contractor, equipment shop drawings which will indicate power hook-up and control connections as required for mechanical equipment. "Stock" Wiring Diagrams are Not Acceptable.

PART 2 PRODUCTS

2.01 Refer to “Energy Code” requirements referenced herein (Particularly power factor correction).

2.02 Refer to & comply with the Electrical Division of these specifications for specific elements to be utilized in this contract and listed therein, including low voltage wiring, conduit, appurtenances and accessories.

2.03 All single-phase motors provided by this Contractor to have built-in thermal overload protection.

2.04 Motor starters, contactors, and disconnects are provided and installed by the Electrical Contractor, unless part of packaged equipment furnished by this Contractor, or otherwise specified.

PART 3 EXECUTION

3.01 All wiring, conduits, etc., shall be in strict accordance with the requirements of the latest edition of the National Electrical Code and Division 16, Electrical specification.

3.02 All wiring, including low voltage wiring, shall be run in conduit.

3.03 Low voltage wiring may be size and type recommended by the Equipment Manufacturer provided it does not conflict with any Code requirements or conditions.

END OF SECTION

SECTION 21 05 30

TESTS & ADJUSTMENTS

PART 1 GENERAL

1.01 SCOPE

A. After work has been completed but before pipe covering has been applied, the Contractor shall test and adjust the systems he has installed.

B. The Owner's Representative shall be notified of all scheduled tests and adjustments at least 48 hours before they are scheduled so that he may witness same. If the Contractor performs any test or adjustment without the Owner's Representative present or without properly notifying the Owner's Representative, the Contractor will be required to perform the test or adjustment a second time in the presence of the Owner's Representative.

C. If the Owner's Representative determines that any work requires special inspection, testing, or approval, he will, upon written authorization from the Owner, instruct the Contractor to order such special inspection, testing or approval. The Contractor shall give timely notice so the Owner's Representative may observe the inspections, tests or approvals. If such special inspection or testing reveals a failure of the work to comply with the requirements of the Contract Documents, the Contractor shall bear all costs thereof, including compensation for the Owner's Representatives additional services made necessary by such failure; otherwise the Owner shall bear such costs, and an appropriate Change Order shall be issued.

D. Concealed lines shall be tested before being concealed. If this is not done and a leak occurs during the final test, this Contractor shall repair leak and all damage resulting there-from.

E. This Contractor shall adjust all his equipment to obtain proper operation and shall demonstrate to the Owner's Representative that the entire system will function properly.

F. All testing shall be in accordance with the applicable NFPA pamphlets listed in section 21 05 00 – FIRE PROTECTION – GENERAL.

PART 2 PRODUCTS

Not applicable.

PART 3 EXECUTION

3.01 After all equipment, outlets, piping and accessories have been installed this contractor shall properly adjust, balance & activate all water systems, record all final data, prepare a detailed report and submit the report, in triplicate, to the Owner's Representative for review. Each copy of the report shall be dated, signed by an officer or partner in the firm and bound in a suitable cover.

3.02 This Contractor shall check for proper alignment before starting any pumping unit with pump and driver mounted on a common base plate with flexible pipe couplings.

3.03 Before turning job over to Owner this Contractor inspect all valves and repack valves as necessary.

3.04 This Contractor shall adjust all equipment in the fire protection system to obtain proper operation and shall demonstrate to the Owner's Representative that the entire system will function properly.

END OF SECTION

SECTION 21 05 31

FLUSHING & STERILIZATION

PART 1 GENERAL

1.01 SCOPE

A. Flush out all domestic water piping systems to remove all dirt, debris, grease and any other foreign matter from pipes and equipment before systems are placed into operation. Clean strainers after each flushing until the strainer remains clean.

B. After domestic water lines are all installed, sterilize lines, including outside services as prescribed by AWWA-C-651. Sterilization shall be done under the immediate on the job supervision of a water testing laboratory regularly engaged in the service and shall be done per their instructions. All fees for testing and test equipment shall be paid by this Contractor.

C. Furnish a Certificate of Sterilization and Approval For Human Consumption signed by a Professional Engineer registered in the State of Ohio regularly in the employ of the Testing Laboratory. Certification shall be furnished to the Architect/Engineer Owner before payment will be made.

PART 2 PRODUCTS

2.01 Sterilization: Chlorinating material either liquid chlorine meeting AWWA Standard B30l, sodium or calcium hypochlorite meeting AWWA Standard B300.

PART 3 EXECUTION

3.01 With all outlets closed, fill system to working pressure and close valve at supply main.

3.02 A cleaning solution containing not less than 50 parts per million of chlorine shall be introduced into the system.

3.03 Each outlet shall be tested during fill to prove the presence of chlorine at that outlet and valves and faucets shall be opened and closed several times during the disinfecting time period.

3.04 Water piping systems shall remain filled for a period of 24 hours.

3.05 All outlets shall be opened wide and the main supply valves opened, flushing system with water until chlorine content is not greater than 0.2 parts per million or until approved by the Health Department. Flush drain valves.

3.06 Sterilization test may be performed at the same time the pressure test is placed on the system.

END OF SECTION

SECTION 21 05 40

VALVE TAGGING AND PIPING IDENTIFICATION

PART 1 GENERAL

1.01 SCOPE

A. Provide identification tags on all valves.

B. Provide identification markers for all piping, except that piping which is within inaccessible structure.

PART 2 PRODUCTS

2.01 Valve tags shall be 16 gauge brass with minimum 2" diameter & brass or stainless steel chain permanently attached to valve. Tags shall state type of line in which the valve is installed (domestic cold water supply, domestic hot water supply, natural gas supply, compressed air supply, vacuum return, etc.) and a unique alpha/numeric identification for each valve.

2.02 Piping markers similar to Seton Setmark semi-rigid plastic type.

A. Direction of flow arrows are to be included at each marker.

B. Each marker background shall be appropriately color coded with a clearly printed legend to identify the contents of the pipe.

C. Snap-around markers shall be used for overall diameters up to 6" and strap-around markers shall be used above 6" overall diameters.

PART 3 EXECUTION

3.01 Furnish a printed text schedule or schedules for all valves with identification, location and purpose of each valve, framed & mounted under glass on wall at location approved by the owner's representative.

3.02 After piping is installed (and painted or provided with insulation cover as applicable); this Contractor shall then install piping identification markers. Flow direction arrows of the same colors are to be located adjacent to the Identification Legends. Pipe identification spacing shall be provided at maximum 20 feet on center, at each branch connection, at each riser, and at least once in each room. Do not use adhesive markers. Colors as follows:

A. Red - Fire Protection
B. Yellow - Dangerous materials
C. Green - Safe materials

D. Blue - Protective materials.

3.03 After piping is installed (and painted or provided with insulation cover as applicable), this Contractor shall then have applied 2" wide color bands on each side of a stenciled legend, lettered with the name of contents of piping. Flow direction arrows of the same colors are to be located adjacent to the Identification Legends. Pipe identification spacing shall be provided at maximum 20 feet on center, at each branch connection, at each riser, and at least once in each room. Do not use adhesive markers. Pipe identification system to be in accordance with the guidelines established by the State of Ohio Engineering standard; available on request form the owner's representative.

3.04 Valve tagging and piping identification systems to be in accordance with the guidelines established in the owner's engineering standard; available on request from the owner's representative.

3.05 In the case of remodeling work when a valve tagging system already exists, numbering shall start with the next number after the highest existing number. Existing valving identification information is available on request from the owner's representative.

END OF SECTION

SECTION 21 05 41

EQUIPMENT IDENTIFICATION

PART 1 GENERAL

1.01 SCOPE

A. This Contractor shall label all primary equipment furnished under this Contract. This included but is not limited to pumps, control panels, alarm valves, etc. Packaged equipment shall be identified as a single item without identification for individual components.

PART 2 PRODUCTS

2.01 Identification labels shall be 1/l6" thick laminated plastic or 0.020" thick aluminum name-plates. Background shall be black with 3/l6" letters engraved on the face. Letters shall be white or natural aluminum.

PART 3 EXECUTION

3.01 Permanently secure identification plates to equipment with non-corrosive screws or epoxy adhesive listed for use with all materials. Locate where clearly visible, and in such a manner as to not impair or damage equipment.

3.02 Equipment identification system to be in accordance with the guidelines established by the State of Ohio Engineering standard; available on request form the owner's representative.

3.03 In the case of remodeling work when an equipment identification system already exists, numbering shall start with the next number after the highest existing number. Existing equipment identification information is available on request from the owner's representative.

END OF SECTION

SECTION 21 05 50

DEMOLITION

PART 1 GENERAL

1.01 SCOPE

A. This Contractor shall be responsible for removal of and modifications to the existing fire protection installation including sprinkler heads, pumps, piping, alarms & other elements as herein noted and as shown on the Drawings. Unless indicated otherwise all elements removed and not reused in remodeling shall become the property of this Contractor and be promptly removed from the site.

B. The General Contractor shall be responsible for all fire protection demolition in all areas that will be renovated as part of this project. Refer to the demolition Drawings and demolition notes. The fire protection contractor shall be responsible for equipment water utility disconnects and coordination with the general contractor to identify the equipment, piping, etc that is to be removed.

C. This Contractor shall remove existing piping, equipment and appurtenances, etc., as shown on the Drawings and as specified. Equipment to be removed includes but is not limited to the following:

1. Water Gong (1)

PART 2 PRODUCTS

Not applicable.

PART 3 EXECUTION

3.01 Unless indicated otherwise this contractor shall be responsible for removing all structures & other elements as required for execution of work in his contract. This includes fixed structures (drywall, plaster, concrete, etc.) requiring cutting, removal, disposal & repair; & accessible structures (lay-in ceiling grids & tiles, etc.) requiring removal, storage & re-installation on completion of the fire protection installation. Care shall be taken with removal & storage of accessible structure components to ensure re-installation to original condition. Any elements damaged during removal, storage or re-installation must be replaced by this contractor at his expense.

3.02 All waste materials associated by the demolition process shall be removed & clean-up performed by this contractor in accordance with general conditions of construction.

3.03 All work in this contract to be done in such a manner as to maintain or minimize interruption of fire protection utility service to the portion of the structure remaining

occupied, active & in-use during regular business hours while construction is underway. This includes scheduling & performing work after normal building operation hours when required as a condition of work.

3.04 Any fire protection systems shut-down, interruption, impairment or removal from service associated with work in this contract shall be scheduled & approved in advance with the owner's representative.

END OF SECTION

SECTION 21 05 51

REMODELING

PART 1 GENERAL

1.01 SCOPE

A. This Contract shall include revisions to all fire protection work in the remodeled portions of the building necessitated to properly integrate with & function within the finished remodeled structure. The remodeled areas shall be as indicated by the architectural and fire protection drawings

B This Contract shall include the removal & re-installation of existing fire protection equipment, and re-routing, re-installation & re-connection of associated piping. All de-activated fire protection equipment & piping not utilized in the remodeled structure shall be removed.

PART 2 PRODUCTS

Not applicable.

PART 3 EXECUTION

3.01 REMODELING

A. In all of the remodeling work the fire protection work shall follow the intent of the Fire Protection Specification insofar as possible with regard to material and workmanship.

D. Where existing structures (including soffits & fur-outs) are removed any exposed fire protection piping that is to remain active & in use on completion of the project shall be offset to the nearest available concealing structure (new or existing) and reconnected as necessary or required, using all new material for the offset. Note that this shall include piping of every description within the fire protection scope of work at both known and unknown locations.

E. Unless indicated otherwise, all piping installed in the remodeling work in finished areas shall be installed as concealed work. This Contractor shall do all cutting & repair of structures as required.

F. Existing fire protection equipment installations that are to remain upon project completion but which interfere with the remodeling work of this or any other project contractor shall be removed & re-installed by this contractor. Scheduling of equipment removal & re-installation shall be coordinated with any & all contractors affected & the Owner's Representative.

3.02 Unless indicated otherwise this contractor shall be responsible for repairing all structures & other elements as required for execution of work in his contract. This includes fixed structures (drywall, plaster, concrete, etc.) requiring cutting, removal, disposal & repair; & accessible structures (lay-in ceiling grids & tiles, etc.) requiring removal, storage & re-installation on completion of the fire protection installation. Care shall be taken with removal & storage of accessible structure components to ensure re-installation to original condition. Any elements damaged during removal, storage or re-installation must be replaced by this contractor at his expense.

3.03 All waste materials associated with the remodeling process shall be removed & clean-up shall be performed by this contractor in accordance with general conditions of construction.

3.04 All work in this contract to be done in such a manner as to maintain or minimize interruption of fire protection utility service to the portion of the structure remaining occupied, active & in-use during regular business hours while construction is underway. This includes scheduling & performing work after normal building operation hours when required as a condition of work.

3.05 Any fire protection systems shut-down, interruption, impairment or removal from service associated with work in this contract shall be scheduled & approved in advance with the owner's representative.

END OF SECTION

SECTION 21 05 60

MANUFACTURERS DRAWINGS

PART 1 GENERAL

1.01 REFERENCE

A. Applicable Division 1 and General Conditions terms and conditions (if any).

1.02 GENERAL CONDITIONS

A. Unless directed otherwise by the Construction Administration portion of the specifications this Contractor shall provide (6) copies of manufacturers submittal data for specific plumbing equipment, fixtures & materials to the Owner's Representative for review within six weeks after the date of contract. This data shall include performance information, wiring diagrams, utility requirements & any other pertinent information necessary for appropriate evaluation. The Owner's Representative will review the Contractor's submittal data for compliance with project specifications & the ability of the associated elements to be furnished & installed as a properly functioning integral element of the overall plumbing installation. Before providing a submittal to the Owner's Representative the Contractor shall:

1. Review each such submission for conformance with the means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto, all of which are the sole responsibility of the Contractor.

2. Approve each submission & so stamp in advance of forwarding to the Owner's Representative.

-confirm & edit/add/delete for specific project conditions-

B. The required Fire Protection submittals are as follows:

1. Piping, including fittings, valves, accessories & appurtenances.
2. Sprinkler heads & accessories.
3. Hose connection valves.
4. Alarm valves & accessories.
5. Alarm initiation devices (tamper switches, flow switches, detectors, pull stations, etc.).
6. Alarm audio/visual devices.
7. Detection & control equipment & accessories.
8. Special suppression systems equipment, accessories & appurtenances.

C. The Owner's Representative shall return shop drawings and related materials with comments provided that each submission has been called for and is stamped by Contractor as indicated above. The Owner's Representative shall

return without comment material not called for or which has not been approved by Contractor.

D. This Contractor shall furnish equipment shop drawings which will indicate power hook up and control connections as required for mechanical equipment. "Stock" wiring diagrams are NOT ACCEPTABLE.

E. The manufacturer shall provide a statement on submittals that equipment furnished complies with the Ohio Energy Code. This previously relates to high efficiency motors, EER's, COP's, etc. If this is not done, submittals will be rejected.

F. Owner's Representative review of manufacturer's drawings or schedules shall not relieve the Contractor from compliance with the requirements of the plans and specifications.

G. Items may be referred to in singular or plural on Plans and Specifications. Contractor is responsible for determining quantity of each item.

PART 2 PRODUCTS

Not applicable.

PART 3 EXECUTION

3.01 Refer to the Construction Administration portion of the specifications & the owner's representative for specific direction in regard to processing submittals for the project, including procedures, time-tables, quantities, routing & approved format.

END OF SECTION

SECTION 21 07 00

FIRE PROTECTION INSULATION

PART 1 GENERAL

1.02 SCOPE

A. Provide listed insulation cover for all items/elements as specified herein, as shown on plans; and for any other items/elements requiring same.

B. Existing piping insulation removed or damaged by new work shall be replaced in accordance with these specifications for new piping of the same system type.

C. Where new insulation cover connects to existing, provide approved transition elements as required for proper integration in a clean, continuous manner.

PART 2 PRODUCTS

2.01 All insulating materials, including jackets, cements, adhesives, vapor barriers, etc., shall be U.L. listed, with a flame spread rating not to exceed 25, and a smoke development rating not to exceed 50. All exterior finishes shall have a minimum service temperature limit (FSTM 70) of minus 50 to 220 degrees F.

2.02 Molded plastic fitting covers shall be U.L. listed, with a flame spread rating not to exceed 25, and a smoke development rating not to exceed 50.

2.03 Insulation thicknesses are based on insulation having thermal resistance in the range of 4.0 HR F ft^2/Btu to 4.6 HR F ft^2/Btu per inch of thickness on a flat surface at a mean temperature of 75°F. Minimum insulation thickness shall be increased for materials having R values less than 4.0 or may be reduced for materials having R values greater than 4.6 to give equivalent "R" values.

2.04 Fiberglass insulation pipe cover shall be similar to Johns Manville "Micro-Lok", rated for 850 degrees F., with a factory applied AP-T all-purpose self-sealing vapor barrier jacket. Butt strips shall be minimum 3" wide, and of same material as jacket. Provide continuous .016” thick aluminum exterior protective cover secured by 1” aluminum strips for the entire length of run, including all fittings & appurtenances. Equal materials, including thickness and conductivity ratings/listings, as manufactured by Owens Corning, Knauf or Manson may be furnished, at the contractor's option.

2.05 Where insulation thickness is indicated for cover herein, it is the nominal MINIMUM required thickness.

2.06 For fiberglass cover, all cements, adhesives, finishes, and associated materials shall be similar to that provided by Foster. Equal materials as provided by Childers or Vimasco may be furnished at the contractor's option.

PART 3 EXECUTION

-confirm all elements, edit/add/select-

3.01 Provide fiberglass cover for wet Fire Protection supply piping and/or other elements in non-conditioned freeze potential and/or exterior areas as follows:

A. Cover with minimum 2" thickness insulation.

B. Butt all edges of insulation and seal all longitudinal laps and butt strips with white vapor barrier cement, similar to Foster no. 85-20; or furnish with manufacturer's integral self-sealing laps.

C. Fittings and mechanical couplings shall be wrapped with compressed fiberglass to same thickness and density as adjacent pipe covering.

D. All appurtenances and accessories such as valves, flanges, unions, etc. installed in referenced piping (with the exception of backflow prevention assemblies) shall be wrapped with full thickness insulation and covered with a listed molded plastic fitting cover; or an open mesh glass cloth shall be applied over wet mastic, and covered with a second coat of fire resistant mastic. Backflow prevention assemblies which require periodic inspection/testing/maintenance shall not be provided with insulation cover, unless these assemblies are in water sensitive locations, such as above lay-in ceilings. If listed backflow prevention assemblies are in water sensitive locations, furnish cover complying with this specification that allows removal and replacement as necessary for required access. Insulation cover at valves & other operable components shall be done in such a manner as to allow proper access & full range of operation.

E. Use 12" long sections of calcium silicate rigid insulation, with jacket same as adjacent pipe covering for transfer of support to piping at each hanger, without stress to the pipe covering assembly. At the contractor's option, an approved wood or high-density (20 lb./cubic foot) fiberglass block may be substituted for the rigid insulation section. Vapor barrier to be maintained throughout.

3.02 All applications shall be made on clean, dry surfaces with all joints butted firmly together.

3.03 Insulation must run continuous through hangers, sleeves and walls for all Fire Protection piping.

3.04 Provide a listed/approved sheet metal protective insulation shield at each hanger.

3.05 No insulation is required for piping which is underground and/or below slab on grade structure.

3.06 Insulation shall not be applied until general construction has progressed sufficiently to minimize potential for physical or moisture damage to the cover assembly. All damaged cover shall be replaced at the contractor's expense.

3.07 Install protective sleeve as specified in section 15015 on all insulated, exposed pipes penetrating floor structure.

3.08 Hanger rods must be perpendicular before insulation is installed.

3.09 Longitudinal lap joints and butt strips for fiberglass piping insulation shall be secured with staples on three (3) inch centers, and sealed with an approved vapor barrier adhesive where applicable. Staples are not required when insulation utilizes a "double" adhesive self-sealing system.

END OF SECTION

SECTION 21 13 13

FIRE PROTECTION PIPING SYSTEM - WET

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install a complete and approved wet sprinkler system. System to be complete with all pipe supports and offsets necessary to clear structure, and all other items/elements provided under separate contract.

B. Sprinkler system shall be installed complete with all necessary accessories, appurtenances and items/elements required for proper, approved operation.

PART 2 PRODUCTS

-175 psig W.O.G. standard system pressure rating, 300 psig W.O.G. maximum for high pressure systems when required (zone by elevation not to exceed 300 psig). edit pipe and connection requirements as necessary-

2.01 PIPE AND FITTINGS

-consider schedule 10 for sizes smaller than 2" only at owner/user direction/approval, and/or for extreme value engineering with reservations noted to owner/user. Use ASTM A53 for state or high standard projects-

A. Pipe shall be Schedule 40 (schedule 30 for sizes 8” and larger) ASTM A135 black steel. Piping 2” size and larger may be schedule 10 with roll grooved couplings and fittings only; cut grooving or threading is not permitted.

B. Schedule 40 pipe fittings shall be class 125 cast or malleable iron screwed or steel flanged type in accordance with NFPA standards for sprinkler/standpipe installation, rated for 175 psig working pressure.

C. Where the shut-off discharge pressure from a fire pump plus the incoming water supply suction pressure exceeds 175 psig, class 250 fittings shall be used, rated for 300 psig working pressure. this shall apply to piping to the inlet of pressure reducing/regulating assemblies set to maintain outlet pressure at 175 psig or less, or to a point where hydraulic calculations prove that the system pressure will not exceed 175 psig under any circumstances.

-confirm schedule 10 application-

D. The Contractor may, at his option for schedule 40 pipe 2" size and larger, use listed/approved grooved fittings and malleable iron mechanical couplings similar to that manufactured by Victaulic. All schedule 10 piping must be roll grooved only.

1. Couplings shall be similar to Victaulic rigid style 005 Firelock with EDPM gasket and housing fabricated in two or more parts of malleable iron

castings. Listed outlet couplings may be used subject to approval by all review and inspection authorities. Final assemblies shall be rated for 300 psig working pressure.

2. Assembly and installation of couplings to be in accordance with the manufacturer's recommendations.

3. Pipe grooving shall be in accordance with the manufacturer's specifications. Roll or cut grooving may be used for schedule 40 pipe at the contractor's option; schedule 10 pipe must be roll grooved only.

4. The Contractor may, at his option, provide equal mechanical couplings as manufactured by ITT Grinnell, Gruvlok or Central Sprink, meeting all requirements listed for grooved piping installation.

5. Elements described elsewhere in this specification may be provided with compatible alternate connections when installed in mechanical coupling piping systems. The mechanical coupling connections for these elements must be provided by the manufacturer with appropriate listings, approvals and pressure ratings as specified. This includes valves, appurtenances, equipment and other elements installed in or connected to mechanical coupling piping systems.

E. Piping in electro-magnetic equipment areas to be non-ferrous type L hard wrot copper with wrot copper pressure fittings. Connections to be socket brazed or listed mechanical coupling type with neoprene gaskets. Installation to be rated for 175 psig working pressure. Extent of electro-magnetic field area to be confirmed from architectural & equipment installation plans in advance.

-confirm plastic application-

F. Piping down-stream of the sprinkler zone control valve assemblies only may be plenum rated ASTM/fire protection service listed SDR 13.5 CPVC pipe with socket solvent weld pressure fittings rated for 175 psig working pressure. Provide listed adapter/transition fittings for integration of threaded fire protection components.

2.06 SPRINKLERS; as specified on plans.

A. In all areas having drop ceilings with surface mounted light fixtures or other items/elements that obstruct sprinkler spray, the Fire Protection Contractor shall install sprinklers with two-piece extended/dropped escutcheon assemblies in lieu of escutcheons specified with the heads.

B. Spare sprinkler head cabinet – provide cabinet at main riser location with sprinkler heads and head wrench(es) for emergency use. Spare head quantities to be as specified by NFPA pamphlet no. 13, corresponding proportionally to the total number of each type installed in the building.

C. All sprinkler heads in light and ordinary hazard occupancy applications to be listed/approved "quick response" type.

-delete victaulic if grooved mechanical couplings are not permitted-

D. Sprinkler heads as manufactured/provided by Reliable, Automatic, Central, Grinnell, Gem, Star, Viking or Victaulic may be furnished at the Contractor's option.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide drain valves and auxiliary drains per NFPA Requirements, and at low points of system to allow complete drainage. Contractor to be responsible to install sprinkler system to drain properly. Piping shall be installed to drain at the main riser whenever possible.

B. Install valves and specialties where indicated and/or as required for approval.

C. The entire sprinkler system installation shall conform to the requirements of NFPA pamphlet no. 13.

D. Piping must be lined up paralleling and at right angles to the building walls and other primary structural elements; angular offsets such as 45° cuts across corners and elsewhere will not be permitted unless specifically shown.

E. This Contractor MUST assume the full responsibility of verifying present elevations in the field and making any adjustments as may be necessary, all of which MUST be included in his Proposal Price.

3.02 Provide sleeves for pipes where piping penetrates masonry walls. All pipe penetrations through masonry walls shall be adequately sealed with mortar or approved fire resistant caulking.

3.03 SPRINKLER HEADS

A. Quantity and location of sprinkler heads to be determined by the Fire Protection Contractor, as required for proper coverage and protection in accordance with specifications on plans.

-confirm with owner/user and insurer for any specific requirements; particularly warehouse, computer, data storage, special operations/processes areas, etc.-

B. Unless indicated or required otherwise, nominal sprinkler head operating temperature ratings to be as follows:

1. Finished, general access areas; 175 degrees F.

2. Non-finished, restricted access areas (mechanical/electrical utility rooms, storage rooms, etc.); 200 degrees F.

3. Water sensitive or electronic technology areas (computer rooms, data storage/processing rooms, switchgear/motor control center rooms, tele-communications rooms, etc.); 200 degrees F.

4. The Fire Protection Contractor is responsible to determine if sprinklers with temperature ratings other than those indicated herein are required due to specific conditions at each installation, and provide sprinklers with appropriate temperature rating at these locations.

C. Where dry pipe barrel sprinkler heads are installed in pre-manufactured or field constructed enclosures (coolers, freezers, etc.), coordinate installation with enclosure manufacturer's recommendations and/or the installing contractor for proper placement and operation. The Fire Protection Contractor is responsible for sprinkler protection installation in such a manner as to maintain the integrity of the enclosure, including prevention of condensation.

D. Recess sprinkler heads to be installed with deflectors no greater than 1/2" from maximum recessed capability. Deflectors of adjacent heads to be at same elevation, plus or minus 1/4".

E. Sprinkler heads to be aligned in respect to structure, and adjacent heads to present a uniform, even linear appearance.

END OF SECTION

SECTION 22 00 00

PLUMBING GENERAL

PART 1 GENERAL

1.01 REFERENCE

A. Sections 22 00 00 through 22 99 99 (as included) cover Plumbing work specifically.

B. Applicable Division 1 and General Conditions terms and conditions (if any).

C. Applicable building construction authorities, codes, standards and guidelines for all Plumbing Contract elements, including but not limited to the following:

1. City of Columbus Building Code, including Plumbing, Fuel Gas, Mechanical, handicap accessibility and energy conservation portions thereof.

2. City of Columbus Board of Health.

3. City of Columbus Environmental Protection Agency (E.P.A.).

4. IFGC International Fuel Gas Code.

5. NFPA pamphlet no. 70, NATIONAL ELECTRIC CODE

6. City of Columbus water utility authority.

7. City of Columbus sewer utility authority.

8. Local gas utility provider.

9. American National Standards Institute (ANSI) standards for materials and construction.

10. American Society of Mechanical Engineers (ASME) standards for materials and construction.

11. American Society of Sanitary Engineering (ASSE) standards for performance and testing.

12. American Society for Testing and Materials (ASTM) standards for materials, construction and testing.

13. American Water Works Association (AWWA) standards for materials, construction and disinfection procedures.

14. National Sanitation Foundation (NSF) standards for materials and construction.

15. Cast Iron Soil Pipe Institute (CISPI) standards for materials and construction.

16. Underwriter's Laboratories (UL) standards for materials and construction.

17. The manufacturer's installation guidelines and recommendations for individual items, elements and/or systems indicated herein.

18. The Owner's material and installation guidelines and/or standards.

19. The Owner's insurance underwriter's material and installation guidelines and/or standards.

1.02 SCOPE

A. The edition of all referenced and applicable codes and standards as recognized and amended by the Building Code and the Inspection/Approval Authority shall apply and shall be the minimum requirement for all materials, methods and installations.

B. This Contractor shall furnish all labor, materials, tools, incidentals, details, etc., necessary to provide a complete, operational and approved Plumbing System, including but not limited to all items and elements described in the Plumbing Specification and shown on the Plumbing Drawings, and as required for coordination and/or interface with work under separate contract as indicated by complete construction documentation package.

1.03 GENERAL CONDITIONS

A. Scheduling of all work performed by this Contractor shall be coordinated with & approved by the Owner's Representative. This contractor shall provide a written schedule of work to the Owner's Representative within (10) days after award of contract.

B. All material hoisting by trade involved.

C. Arrangements for storage of tools and material, removal of debris, and interruptions of services shall be made with the owner's representative.

D. All piping, equipment and other elements installed by this Contractor shall be located to miss all ceiling inserts, openings and sleeves for work of all trades, except where otherwise noted. This Contractor is referred to the complete

construction documentation for the project available on request from the owner's representative.

E. The Contractor, insofar as this Contract is concerned, shall at all times keep the premises and the building in a neat and orderly condition.

F. At the completion of the project, this Contractor shall promptly clean up and remove from the site all debris and excess materials associated with the execution of work in his contract.

G. DRAWINGS

1. Consult all Contract Drawings which may affect the locations of any equipment, apparatus, piping, fixture & all other elements in this contract and make minor adjustments in location necessary for coordination.

2. Piping and equipment layout is schematic and exact locations shall be determined by structural and other conditions and verified in the field. This shall not be construed to mean that the design of the system may be changed, it refers only to the exact location of piping and equipment to fit into the building as constructed, and to coordination of all work with piping and equipment included under other Divisions of the Specifications.

3. The layout shown on the Drawings is based on a particular make of equipment. If another make of equipment is used which requires modifications or changes of any description from the Drawings or Specifications, this Contractor shall be responsible for making all such modifications and changes, including those involving other trades, as a part of this Contract and the cost thereof shall be included in his Bid. In such case, the Contractor shall submit Drawings and Specifications showing all such modifications and changes prior to starting work, which shall be subject to the approval of the owner's representative.

4. The owner's representative reserves the right to make minor changes in the location of piping and equipment up to the time of rough-in without additional cost to the Owner.

5. Mechanical equipment room layout as shown is arranged with adequate space for service and access. This Contractor shall adhere to the clearances shown when installing equipment and piping. Final location of equipment in this contract is subject to approval by the owner's representative.

6. Where certain grades and/or elevations are given on the Drawings, they have been obtained from the best information available; however, they are not guaranteed. This Contractor MUST assume the full responsibility of verifying present elevations in the field and making any adjustments as may be necessary, all of which must be included in his Bid Price.

7. Due to the scale of the Drawings, it is impossible to show all offsets and transitions which may be required. This Contractor shall carefully investigate the conditions affecting all work and shall furnish all elbows, fittings, transitions, etc., required to accomplish the desired result at no additional cost to the Owner.

8. Install all work as close as possible to walls, structural, members, etc., consistent with the proper space for covering, access, etc., so as to occupy the minimum of space and allow as much space as possible between equipment, fixtures, piping, etc. and all adjacent surfaces & structures.

9. Actual dimensions shown on the Drawings and field dimensions shall take precedence over scaled dimensions.

10. All field adjustment & coordination modifications to work indicated by the original issue Plumbing Construction Drawings shall be properly recorded by hand & maintained on the Field Construction Drawing Set kept on site.

11. All addendums, bulletins & any other revisions issued by the Owner's Representative shall be posted to or maintained with the Field Construction Drawings & Specifications on site in a timely fashion.

H. ENERGY CODE

1. All applicable elements in the Plumbing System must comply with all requirements of the State of Ohio "Code of Energy Conservation". This includes, but is not limited to, efficiencies, power factors, insulation thickness, conservation, etc.

2. All motors rated greater than 1000 watts shall have a power factor of not less than 85% under rated load conditions. Power factor of less than 85% shall be corrected to at least 90% under rated load conditions.

   a. For motors up to and including 50 Horsepower, the manufacturer shall provide motors with a power factor of not less than 85%. If this is not possible, then the manufacturer shall provide and install Power Factor corrective devices to comply with this Code.

   b. Motors larger than 50 Horsepower with starters furnished by the Electrical Contractor will have Power Factor corrective devices furnished and installed by the Electrical Contractor.

   c. On all Package equipment where starters are provided with the equipment such as chillers, heat pumps, rooftop units, etc., the manufacturer will be responsible for providing and installing Power Factor corrective devices to comply with this Code.

d. Where power factor corrective devices are installed, they shall comply in all respects to the latest edition of the National Electrical Code.

I. OPERATING AND MAINTENANCE INSTRUCTIONS

1. This Contractor shall thoroughly instruct and supervise the Owner's Maintenance Personnel in the proper operation and maintenance of the plumbing system equipment. This Contractor shall be responsible for arranging and scheduling the instruction and supervision, and for notifying the owner's representative at least 48 hours in advance.

2. Instructions shall include the following:

a. Location of equipment and explanation of what it does.

b. Reference to "Operating Instruction Manuals" for record and clarity.

c. Coordination of written and verbal instruction so that each is understood by all personnel.

d. Specific maintenance to be performed by Owner.

3. This Contractor shall furnish three (3) copies of the printed Operating and Maintenance Instructions for the Plumbing Systems to the Owner's Representative for review. Each copy shall be neat, legible and bound in a hard back 3-ring notebook. Instructions shall consist of the following items:

a. Title Page; date of submittal, project title, project address; & the name, address and telephone number of the Contractor, the Owner's Representative & the Engineer.

b. Second Page; Index of Manual Contents.

c. Third Section; Routine and 24-hour emergency information:

1. Name, address and telephone number of servicing agency.

2. Include names of personnel to be contacted for service arrangements.

d. Fourth Section; A copy of each approved & corrected submittal with an index at the beginning of the section.

e. Fifth Section; A list of all equipment used on the project, together with supplier's name and address.

f. Sixth Section; Manufacturer's maintenance manuals for each item of equipment furnished under this Contract. Manuals shall include such items as parts lists, detailed service instructions, procedures for performing normal maintenance & service functions, preliminary trouble shooting procedures and wiring diagrams. Wiring diagrams to be as actually wired including control and interlock wiring.

g. Seventh Section; copies of the valve & equipment identification schedules noted in "VALVE TAGGING AND PIPING IDENTIFICATION" & "EQUIPMENT IDENTIFICATION" specification sections.

h. Eighth Section; Copy of Warranty/Guarantee Letter.

i. Ninth Section; Copy of all documented plumbing systems testing, inspection, balancing, certification & adjustment reports, including certificate of sterilization for the domestic water system.

j. Tenth Section; Copy of all observation reports indicating confirmed compliance with all action items listed.

k. Eleventh Section; Provide an electronic data copy of the corrected & up to date coordination drawings. Approved data format (PDF, ACAD drawing file, etc.) & media format (CD, DVD, etc.) to be confirmed with the owner's representative.

J. RECORD DOCUMENTS

1. The Contractor shall keep an accurate record of all deviations from Contract Drawings and Specifications. He shall neatly and correctly enter in colored pencil any deviations on Drawings affected and shall keep the Drawings available for inspection. Extra sets of Drawings will be furnished for this purpose.

2. At the completion of project and before final approval, make any final corrections to Drawings and certify to the accuracy of each print by signature and deliver same to the owner's representative.

K. SUPERVISION

1. This Contractor shall have in charge of the work, on the job during construction, a competent superintendent experienced in the work installed under this Contract.

L. UNACCEPTABLE WORK AND OBSERVATION REPORTS

1. Work shall be unacceptable when found to be defective or contrary to the Plans, Specifications, Codes specified or accepted standards of good workmanship.

2. The Contractor shall promptly correct all work found unacceptable by the owner's representative whether observed before or after substantial completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such unacceptable work.

3. During the course of construction, the owner's representative will prepare and issue "Observation Reports" including a list of items found to be in need of correction. All action items listed shall be corrected by the Contractor. A space is provided on the form for the Contractor to note the completion of each item. All prior "Observation Report" items must be completed, the lists signed and returned to the owner's representative prior to making the final inspection. After the final list is issued, the same procedure will apply.

M. FINAL INSPECTION

1. When the Contractor determines all work is completed and working properly per the Contract Documents, he shall request a "final" inspection by the owner's representative in accordance with general conditions requirements. If more than one re-inspection is required after this final inspection, the Contractor shall bear all additional costs including compensation for the owner's representative's additional services made necessary thereby. A final inspection will not be made until Operating and Maintenance Manuals have been submitted and approved, and all outstanding "Observation Report" action items completed, confirmed, signed and returned to the owner's representative.

N. GUARANTEE

1. This Contractor is responsible for all defects, repairs and replacements in materials and workmanship, for a period of one (1) year after final payment is approved by the owner's representative. Provide a letter to this effect in the operations & maintenance manual.

O. PERMITS AND FEES

1. Unless directed otherwise by the General Conditions portion of project documentation, the Plumbing Contractor shall apply for and pay any review, inspection, permit, license, testing and/or other service fees required by all review/inspection/approval authorities in connection with the work under this Contract.

2. Unless directed otherwise by the General Conditions portion of project documentation, the Plumbing Contractor shall apply for and pay any procurement, tap, capacity, metering, testing and/or other service fees

required by all Utility Providers (Water, Gas, Sewer, etc.) in connection with the work under this Contract. This shall include procurement, execution and return of any forms and/or applications required; and participation in individual, initial design/installation consultations with the providers if required.

P. PLUMBING UTILITY CONNECTIONS FOR ITEMS OR ELEMENTS NOT INCLUDED IN THE PLUMBING CONTRACT

1. Provide Plumbing supply, waste, drain, vent, and any other piped utilities included for the project as required, as listed herein, and/or as shown on the Plumbing Drawings for items furnished and/or installed under separate contract requiring same. These items shall include, but not be limited to the following:

2. HVAC equipment; final connection (where applicable) by the HVAC Contractor.

3. Owner provided items; final connection (where applicable) by the Plumbing Contractor.

4. Rough-in Plumbing supply, waste, drain, vent, and any other piped utilities included for the project as required, as listed herein, and/or as shown on the Plumbing Drawings for all future items requiring same.

Q. Concrete housekeeping and support pads for equipment in the Plumbing Contract are the responsibility of the Plumbing Contractor. Concrete pad construction to be in accordance with specifications provided in the General Contract for same.

R. Protect all fixtures, equipment, piping & other elements installed in this contract against damage from any cause whatsoever and pay the cost of cleaning, replacing and/or repairing of same made necessary by failure to provide suitable protection.

1.04 BUILDING AUTHORITIES REVIEW & INSPECTION

A. The Contractor is responsible for arranging & scheduling required construction reviews & inspections with the Building Authorities, including on-going inspections at code specified stages of construction as well as final inspection.

B. The Contractor is responsible for compliance with all Building Authorities review and inspection directives in regard to methods of installation code compliance, including appropriate types & uses of materials, fixtures, equipment & other elements specified.

C. The Contractor is responsible for satisfactorily addressing all specific Building Authorites concerns & comments generated by their review & inspection in

regard to methods of installation code compliance, including appropriate types & uses of materials, fixtures, equipment & other elements specified. This shall include response to the Building Authorities in writing if necessary, with copies to the owner's representative.

D. When the work is completed, the Contractor shall furnish the owner's representative a Certificate of Final Inspection and Approval from the Building Authorities for the Plumbing Systems installation as required for project closeout.

1.05 COORDINATION

A. All work shall be done in a neat and workmanlike manner and this Contractor shall coordinate his work with all other Contractors on the project to ensure that his work does not interfere with the proper installation of work by other trades. This shall include full participation in preparation of construction coordination drawings in the format indicated by the owner's representative.

PART 2 PRODUCTS

2.01 GENERAL

A. Where items/elements are indicated herein to be listed/approved, the intent of this specification is that said item/element shall be listed by all applicable material/construction standards and subject to final approval (including methods of installation) by all review/inspection/approval authorities.

B. Unless indicated otherwise, all plumbing contract items/elements (pipe, fittings, valves, specialties, fixtures, equipment, etc.) materials, construction, performance, testing and methods of installation to be as listed/approved by all applicable material/construction/installation standards for same, and be in accordance with the requirements of all review/inspection/approval authorities. This includes, but is not limited to, the standards and authorities referenced in this specification. In the absence of such standards and/or requirements, the item/element manufacturer's recommendations, as confirmed by the Plumbing Contractor in advance, shall be followed.

C. Unless indicated otherwise, all Plumbing piping shall be in accordance with the following standards in regard to materials, construction, dimensions/tolerances, type of service/transmission medium (water, air, gas, etc,) and methods of installation (as applicable), and shall be so listed. Final approval for use is subject to the requirements of the review and inspection authorities:

1. Steel pipe, plastic pipe, steel, plastic, malleable and cast iron fittings and joining methods; per applicable ASTM/ANSI/ASME standards. In addition, where utilized for potable water service, all elements shall be per applicable NSF and ASTM A53 (for carbon steel) standards.

2. Ductile iron pipe, fittings and joining methods; per applicable ASTM/ANSI/ASME/AWWA/NSF standards.

3. Plastic pipe, fittings and joining methods; per applicable ASTM/ANSI/ASME/AWWA/NSF standards.

4. Cast iron pipe, fittings and joining methods; per applicable ASTM/ANSI/ASME/CISPI standards.

5. Copper/copper alloy/brass pipe/tube, fittings and joining methods; per applicable ASTM/ANSI/ASME standards. In addition, where utilized for potable water service, all elements shall be per applicable NSF standards.

D. All Plumbing Contract items/elements shall have the manufacturer's mark or name and the quality of the product or identification of same cast, embossed, stamped or indelibly marked on each item/element in accordance with the standards under which they are accepted and approved per applicable code(s).

E. PLUMBING UTILITY CONNECTIONS PROVIDED FOR ITEMS OR ELEMENTS NOT INCLUDED IN THE PLUMBING CONTRACT

1. Unless indicated otherwise, the Plumbing Contractor shall furnish and install all traps and stops (as applicable) as required for items furnished under separate contract. This includes items with connections by the Plumbing Contractor or with connections under separate contract.

2. Unless indicated otherwise, Fixture traps above floor slab connected to the sanitary waste system shall be cast brass P-traps with integral cleanout. P-traps below floor slab to be cast iron, less cleanout. See plans for sizes.

3. Unless indicated otherwise, all waste and drain rough-ins for future shall terminate with a short nipple and cap and no trap.

4. Unless indicated otherwise, all supply rough-ins for future shall terminate with a short nipple and cap.

5. Unless indicated otherwise, where connection elements described herein are exposed in locations other than restricted access utility or maintenance areas, all metallic components to be furnished with a polished chrome finish. Wall or other structure piping penetrations at these locations to be provided with polished chrome finish escutcheons.

PART 3 EXECUTION

3.01 GENERAL

A. Where standards, codes or guidelines are referenced herein and throughout the Plumbing Contract documentation, including plans and specifications, the latest

version/edition shall be applied, unless the Building Code references another version/edition, which shall take precedence.

B. Refer to project documentation furnished with the complete construction package in advance of work for overall coordination and verification of requirements at work of other trades relating to, interfacing with, and/or impacting work in the Plumbing Contract. This includes exact locations, quantities, physical sizes, rough-in details, pipe routing, connection sizes, etc., for items included both in the Plumbing Contract and under separate contract. Coordinate installation and interface requirements with the appropriate contractor(s) in advance of work.

C. Include any minor details, items and/or elements essential to necessary approvals and successful operation in addition to the items specified herein and shown on plans.

D. See general "PLUMBING NOTES" on plans for additional conditions and requirements relative to the Plumbing Contract.

E. Plumbing items and elements shall be installed with due regard to preservation of the strength of structural members and prevention of damage to walls, surfaces and other structures through installation, bearing support or subsequent usage of Plumbing items and elements. No framing or other support structure shall be cut, notched or bored in excess of limitations specified in the Building Code, or by the manufacturer of the framing or other support structure, as confirmed in advance of work by the Plumbing Contractor.

3.02 INSTALLATION OF PIPING

A. All piping systems shall be installed with adequate provisions made for expansion and contraction to prevent stresses on piping, valves and equipment. Anchor and guide piping at all points indicated and/or as required. Type and method of anchoring, guiding and attachments to sustaining members to suit job requirements and conditions and shall be approved by the owner’s representative.

B. Provide pipe loops in domestic hot water and re-circulating lines and heating lines where shown on Drawings or required for accurate control of movement. As a minimum, metallic domestic hot water supply and return lines shall not run more than 100 linear feet without a pipe loop or other approved means of expansion control being provided, whether indicated on plans or not. Plastic piping runs shall not exceed 50 linear feet. Sizing of pipe loops to be per the pipe manufacturer’s recommendations & guidelines.

C. Provide unions or flanges at each final connection to each piece of equipment. Branches from mains to equipment stubs, risers, etc. shall have swing joints with at least one change of direction in the horizontal plane and one change of direction in the vertical plane before connecting to equipment or fixtures. Piping shall be arranged and unions and flanges located to permit easy removal of parts and equipment for service, maintenance, inspection, cleaning & components

removal/replacement without cutting, repair or disconnecting any part except unions or flanges. No welded connections shall be made to valves or equipment. Use bronze unions in copper lines. Use dielectric unions when joining dissimilar piping materials. Pipe unions shall be installed downstream of equipment isolation valves.

D. Flange bolts shall be cut to proper length so that one thread projects beyond the nut when nut and bolt are tightened.

E. Make proper connections to all items of equipment in the Contract as recommended by the Manufacturer or as detailed on the Drawings.

F. All piping shall be arranged in accordance with the best standards of the trade with vertical pipes plumb and horizontal runs parallel or perpendicular to the building wall.

G. Provide valves and specialties where indicated on the Drawings.

H. Provide 3/4" drain valves in supply & return piping at low points to provide complete drainage of all systems. Drain valves in potable domestic water lines to include a listed/specified permanently affixed backflow prevention device at the outlet connection point.

I. Ream ends of pipe and clean before installing.

J. All joints in copper piping shall be made with certified/listed “lead-free” solder materials. Solder materials containing lead are prohibited.

K. All joints in underground copper piping shall be brazed.

L. Use pipe dope on male threads of screwed pipe only. Teflon pipe joint tape may be used, at the Contractor's option.

M. Valves to be installed with hand-wheel at or above center of pipe. Valves outdoors exposed to weather shall be installed with hand-wheel in the horizontal.

N. Valves & other in-line piping operable elements (levers, handles, rising stems, etc.) to be installed in such a manner as to allow full range of operation without restriction or impairment; & without interfering with the operation & access of any & all adjacent elements (structure & work of other trades).

O. Make all changes of direction with fittings, rather than bending.

P. Flanged joints shall be faced true and square. Flanges shall be same face style as mating surface to which it is connected.

Q. Install thermometers and gauges so they may be read from floor level.

R. Install Pete's Plugs as close as possible to control valves, coils, etc., as shown on the Drawings, and arranged so that a probe may be inserted into the plug.

S. All valves and unions to be installed so as to be accessible through removable ceiling tiles, access doors/panels, etc.

T. Where piping is installed in accessible chases, keep all piping to sides of chase, except portions which must necessarily be in center of chase. Offset vents to side immediately above connection to waste line. All lateral runs are to be located at the floor or minimum 6'-0" above floor, and all vertical piping held close to the wall through that height leaving maximum service space.

U. Provide dielectric unions or insulating flanges between dissimilar metals, i.e., copper to steel.

V. Where pipe drops occur in block walls, pipes to enter and leave walls at block joints. Coordinate with General Contractor. Whenever possible, pipe drops in walls to be a single length of pipe or tubing with no or minimal fittings.

W. Install galvanized sheet metal troughs with drains under pipes crossing electrical equipment. Seal to make water tight and provide pan drain to discharge at an approved location. See plumbing notes on plans for additional detail.

X. Properly support all relief valve discharge piping and provide no more than one 90° elbow fitting whenever possible. Where the relief valve discharge from a water heater is extended outside of the room or enclosure where the heater is installed, an air gap fitting shall be provide in the discharge piping within the heater room or enclosure.

Y. Bull head connections in any piping service are expressly prohibited.

Z. At the end of each day's work and otherwise as required or directed, provide caps and/or plugs at all openings in piping for protection. Particular attention must be given to avoid the possibility of any foreign materials entering the pipes during on-going construction, whether it be inadvertent or with malicious intent.

AA. When plastic piping is installed in framed wall or floor structures, provide nail strike protection in accordance with plumbing code requirements.

BB. All plumbing fixtures and equipment to have an individual accessible shut-off or stop valve at the supply piping connection points.

3.03 PROTECTION & CLEANING

A. After all equipment has been set it shall be thoroughly cleaned, removing all stickers, rust stains and other foreign matter and leave every part in acceptable condition, clean and ready for use.

B. After all piping & equipment has been approved and after all plastering has been completed, piping (with & without cover) & equipment provided under this Contract shall be thoroughly cleaned of dirt, debris, grease, rust, oil & any other foreign matter and primed (where necessary), ready for painting.

C. Repair all dents and scratches in factory prime or finish coats on all equipment, including plumbing fixtures, to the satisfaction of the Owner's Representative. If damage is excessive, replacement may be required.

D. Flush out all piping systems to remove all dirt, debris, grease and any other foreign matter from pipes and equipment before systems are placed in operation. Clean strainers after each flushing until the strainer remains clean.

E. Cover all equipment, motors, pumps, open pipes, etc., to keep out dirt, debris, water, weather and any other foreign matter during construction.

F. This Contractor shall clean up and remove all debris from the site on a daily basis and shall at all times keep the premises in a neat and orderly condition.

3.04 EQUIPMENT

A. All equipment in this contract that includes drive motors, controls, electronic supervision and/or alarms (water heaters, pumps, compressors, etc.) shall be:

1. Tested for proper operation by the manufacturer in advance of shipment with appropriate certification provided on delivery. Packaged equipment shall be tested by the manufacturer as a complete assembly. This certification shall be included in the operations & maintenance package provided to the owner on project closeout.

2. Reviewed & approved for proper installation by the manufacturer's authorized representative once installation is complete by this contractor, and in advance of start-up or operation.

3. Activated, started-up & operated/run by or under the direct supervision of the manufacturer's field representative on-site, including any & all necessary adjustments, settings & calibrations required for proper operation & service as specified. Upon successful completion of this process the manufacturer's representative shall provide certification of same. This certification shall be included in the operations & maintenance package provided to the owner on project closeout.

3.05 CERTIFICATION & COMMISSIONING

A. This contractor shall install & test all medical systems, equipment, piping & components thereof in accordance with NFPA pamphlet no. 99 requirements, ready for independent third party review & certification for compliance arranged & paid for by the owner. If any element or portion of the installation is found not to be in compliance with NFPA 99 standards by the certification authority this

contractor shall make necessary corrections at no additional cost to the owner as required for certification.

B. This contractor shall install & test all plumbing systems, equipment, piping & components thereof in accordance with the requirements of all code & regulatory agencies, equipment manufacturer's recommendations & good engineering practices, ready for independent third party review & commissioning arranged & paid for by the owner. If any element or portion of the installation is found not to be in compliance with said requirements by the commissioning agency this contractor shall make necessary corrections at no additional cost to the owner as required for successful completion of commissioning.

3.06 EQUIPMENT FURNISHED BY OWNER

A. Equipment shall be installed in accordance with manufacturer's instructions. This Contractor shall obtain these instructions from each manufacturer, or from the Owner, and these instructions shall be considered part of these Specifications.

B. Any defects or differences in Owner furnished equipment shall be reported to the Owner for consideration before proceeding with the work. All equipment shall be received and unloaded, stored in a location designated by the Owner, and protected from the weather by this Contractor. This Contractor shall be responsible for and pay particular attention to coordination of delivery of equipment.

END OF SECTION

SECTION 22 05 10

FIRE-STOPPING

PART 1 GENERAL

1.1 SCOPE

A. This Contractor shall be responsible for fire-stopping at all penetrations of rated structures by work in this contract. Fire-stopping shall be performed by an installer who has been trained & certified by a listed Fire-stopping products manufacturer in the published UL systems installation procedures. Location, rating & specific details of rated structures to be as indicated by the architectural portion of the complete construction documentation set.

B. Fire-stopping is defined as materials or combination of materials used to retain integrity of fire and/or smoke rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in rated structures including walls & floors.

C. Test Requirements:

1. ASTM E-814, "Standard Method of Fire Tests of Through Penetration Fire Stops".

2. ASTM E-84, Standard Test Method for Surface Burning Characteristics of Building Materials.

3. International Fire-stop Council Guidelines for Evaluating Fire-stop Systems Engineering Judgments.

4. Underwriters Laboratories (UL) of Northbrook, IL runs ASTM E-814 under their designation of UL 1479 and publishes the results in their "FIRE RESISTANCE DIRECTORY" that is updated annually.

a. UL Fire Resistance Directory:

i. Through-Penetration Fire-stop Devices (XHCR)
ii. Fire Resistance Ratings (BXUV)
iii. Through-Penetration Fire-stop Systems (XHEZ)
iv. Fill, Voids, or Cavity Material (XHHW)
v. Forming Materials (XHKU)

5. QUALITY ASSURANCE

a. A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of fire-stop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

b. Fire-Stop System installation must meet requirements of ASTM E-814 or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated.

c. Proposed fire-stop materials and methods shall conform to applicable governing codes having local jurisdiction.

d. Fire-stop systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

e. For those fire-stop applications that exist for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment drawings must follow requirements set forth by the International Fire-stop Council.

6. SUBMITTALS

a. Submit Product Data: Manufacturer’s specifications and technical data for each material including the composition and limitations, documentation of UL fire-stop systems to be used and manufacturer's installation instructions.

b. Manufacturer's engineering judgment identification number and drawing details when no UL system is available for an application. Engineer judgment must include both project name and contractor’s name who will install fire-stop system as described in drawing.

c. Submit material safety data sheets provided with product delivered to job-site.

7. INSTALLER QUALIFICATIONS

a. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the fire-stopping manufacturer as having been provided the necessary training to install manufacturer’s products per specified requirements. A manufacturer’s willingness to sell its fire-stopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

8. DELIVERY, STORAGE, AND HANDLING

a. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

b. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

c. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.

d. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

e. Do not use damaged or expired materials.

9. PROJECT CONDITIONS

a. Do not use materials that contain flammable solvents.

b. Scheduling

i. Schedule installation of CAST IN PLACE fire-stop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.

ii. Schedule installation of other fire-stopping materials after completion of penetrating item installation but prior to covering or concealing of openings.

c. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

d. Weather conditions: Do not proceed with installation of fire-stop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

e. During installation, provide masking and drop cloths to prevent fire-stopping materials from contaminating any adjacent surfaces.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide fire-stopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the fire-stopping under conditions of service and application, as demonstrated by the fire-stopping manufacturer based on testing and field experience.

B. Provide components for each fire-stopping system that is needed to install fill material. Use only components specified by the fire-stopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

2.2 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with through penetration fire-stop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:

1. Hilti, Inc., Tulsa, Oklahoma, (800)879-8000
2. Tremco Sealants & Coatings, Beachwood, Ohio, (216) 292-5000
3. 3M Fire Protection Products, St. Paul, Minnesota, (612) 736-0203
4. Specified Technologies Inc., Somerville, New Jersey, (800) 992-1180
5. Nelson Fire-stop Products, Tulsa, Oklahoma, (918) 641-7299
6. Fox Couplings, Inc., Jacksonville, Florida, (904) 396-2865
7. Proset Systems Inc., Lawrenceville, Georgia, (800) 262-5355
8. Equivalent products listed in the UL Fire Resistance Directory – Volume 2

2.3 MATERIALS

A. Use only fire-stop products that have been UL 1479, ASTM E-814 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Cast-in place fire-stop devices are installed prior to concrete placement for use with non-combustible and combustible plastic pipe (closed and open piping systems) penetrating concrete floors, the following products are acceptable:

1. Hilti CP 680 Cast-In Place Fire-stop Device
2. Fox Coupling, Inc. "Cast-In-Place Fire-stop Coupling".
3. Proset Cast-In-Place Device
4. Equivalent products listed in the UL Fire Resistance Directory – Volume 2

C. Sealant or caulking materials for use with non-combustible items including steel pipe & copper pipe, the following products are acceptable:

1. Hilti FS-ONE Intumescent Fire-stop Sealant
2. 3M Fire Barrier CP25 or Fire-stop Sealant 2000
3. Tremco Fyre Shield
4. STI LC Latex Endothermic Sealant and SSS Intumescent Sealant
5. Nelson LBS Sealant
6. Equivalent products listed in the UL Fire Resistance Directory – Volume 2

D. Intumescent sealant or caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe and plastic pipe, the following products are acceptable:

1. Hilti FS-ONE Intumescent Fire-stop Sealant
2. 3M Fire Barrier CP25WB+
3. Tremco Intumescent Acrylic or TremStop WBM
4. STI SSS Intumescent Sealant
5. Nelson LBS Sealant
6. Equivalent products listed in the UL Fire Resistance Directory – Volume 2

E. Fire-stop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:

1. Hilti CP 642 and CP643 Fire-stop Collar, CP645 Wrap Strip
2. Tremco TREMstop D Combustible Pipe Intumescent Device System and TremStop WS Wrap Strip
3. 3M Ultra Plastic Pipe Device and Fire Barrier FS-195+ Wrap Strip
4. STI SSC Fire-stop Collars and Intumescent SSW Wrap Strip
5. Nelson PCS Plastic Pipe Choke System and WRS Wrap Strip
6. Equivalent products listed in the UL Fire Resistance Directory – Volume 2

F. Materials used for large size/complex penetrations made to accommodate multiple steel and copper pipes, the following products are acceptable:

1. Hilti FS 635 Trowel-able Fire-stop Compound and FS 657 FIRE BLOCK
2. Tremco TremStop M Fire Rated Mortar and PS Pillows
3. 3M Fire Barrier CS-195+ Composite Sheet

4. STI SSM Fire Rated Mortar and SSB Fire-stop Pillows
5. Nelson CMP Fire-stop Compound and PLW Fire-stop Pillows
6. Equivalent products listed in the UL Fire Resistance Directory – Volume 2

G. Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate multiple steel and copper pipes, the following products are acceptable:

1. Hilti FS 657 FIRE BLOCK
2. Tremco PS Fire-stop Pillows
3. 3M CS Intumescent Sheet
4. STI SSB Fire-stop Pillows
5. Nelson PLW Fire-stop Pillows
6. Equivalent products listed in the UL Fire Resistance Directory – Volume 2

H. Provide a fire-stop system with an "F" Rating as determined by UL 1479 or ASTM E814. The F rating must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated.

PART 3 EXECUTION

3.1 PREPARATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify penetrations are properly sized and in suitable condition for application of materials.

2. Surfaces to which fire-stop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by fire-stopping materials.

4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of fire-stopping.

5. Do not proceed until unsatisfactory conditions have been corrected.

3.2 COORDINATION

A. Coordinate location and proper selection of cast-in-place fire-stop assemblies with the trade responsible for the associated structure. Ensure fire-stop assembly is set in framing at the proper location & secured in place prior to construction.

B. Responsible trade to provide adequate spacing of field run pipes to allow for installation of cast-in-place fire-stop devices without interferences.

3.3 INSTALLATION

A. Regulatory Requirements: Install fire-stop materials in accordance with UL Fire Resistance Directory.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration joint materials.

C. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

D. Protect materials from damage on surfaces subjected to traffic.

3.4 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities.

C. Perform under this section patching and repairing of fire-stopping caused by cutting or penetrating of existing fire-stop systems already installed by other trades.

3.5 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed holes and joints to be free of excess fire-stop materials and soiling as work progresses.

END OF SECTION

SECTION 22 05 11

VALVES

PART 1 GENERAL

1.1 SCOPE

A. Furnish and install all necessary valves for piping systems and equipment in the building required to provide proper shut off, balancing & control of systems included under this Contract.

B. Where valves are installed in potable domestic water piping, they shall be listed for such service and in compliance with plumbing code materials and construction requirements.

C. Furnish & install access doors for piping specialties installed within or behind fixed structures such as drywall, plaster, gypsum, concrete, brick, etc. as required for access, maintenance & operation.

PART 2 PRODUCTS

2.1 Gate and check valves shall be Watts, Mueller, Grinnell, Crane, Hammond, Jenkins, Milwaukee, Nibco, Powell or Stockham and shall all be by the same manufacturer.

2.2 Ball valves shall be as manufactured by Apollo or any of the manufacturers listed herein for gate and check valves.

2.3 Butterfly valves shall be as manufactured by Keystone, Center Line or any of the manufacturer's listed herein for gate and check valves.

2.4 Each type of valve (gate, ball, check, etc.) to be by a single listed manufacturer when available.

2.5 All valves not accessible for operation with a standard 7 foot ladder or in obstructed/restricted access locations shall be provided with remote chain operators.

2.6 Where any control/shut-off valves (gate, ball, butterfly, balance/stop, etc.) are provided for piping installation including insulation cover they shall be provided with extensions by the valve manufacturer as required for un-restricted full range operation with damage to the insulation.

2.7 GATE VALVES

A. 3" and larger - iron body, bronze mounted, O.S.&Y., flanged, taper solid wedge disc, rising stem, 125 lb. S.W.P.

B. 2-1/2" and smaller - all bronze industrial grade type with threaded connections, tapered solid wedge disc, union bonnet & rising stem.

C. At the Contractor's option, gate or ball valves 2" and smaller may be "Butterball" butterfly valves Style BB1-100, bronze body with threaded ends, lever handle, stainless steel disc and stem, rated for 175 lb. W.O.G.

D. Where gate valves 2-1/2” size and smaller are indicated on plans, the Contractor has the option to provide ball valves as specified herein. Where ball valves are indicated, they are to be provided as specified herein; no options allowed.

E. Where gate valves 3” and larger are indicated on plans, the Contractor has the option to provide butterfly valves as specified herein. Where butterfly valves are indicated, they are to be provided as specified herein; no options allowed.

2.8 BALL VALVES

A. 2-1/2" size and smaller shall be two-piece bronze body ball valve with threaded connections, union connection body, teflon seats, conventional port, blowout proof stem, adjustable packing gland, chrome plated bronze ball, and lever handle labeled for service controlled. Rated for 150 psig SWP & 400 WOG.

2.9 Unless indicated otherwise, drain valves shall be bronze construction ball valves as specified herein.

2.10 BUTTERFLY VALVES

A. 2-1/2" to 20" size shall be cast or ductile iron valve. Furnish with lug pattern body, aluminum bronze disc, stainless steel stem, EPDM seat, extended neck for full 2" insulation, and positive shut off at 175 psig W.O.G. (2-12") and 150 psig W.O.G. (14"-20").

B. 5" and smaller shall have minimum 10 position lever actuators, with positive latching and position indicator. Valves 6" and larger shall have worm gear actuator.

C. Valves used on outlets of devices for balance purposes shall have an adjustable memory stop (position lock). A notched operator by itself is not considered a memory stop.

D. When victaulic piping is specified and utilized, Victaulic Style 300 butterfly valves for piping 2" to 12" may be furnished at the Contractor's option.

2.11 CHECK VALVES

A. 3" and larger - iron body, bronze mounted, horizontal swing check with bronze disc, flanged, 125 lb. S.W.P.

B. 2-1/2" and smaller - all bronze, horizontal swing check with bronze or TFE disc, screwed, 125 lb. S.W.P.

C. Non-slam check valves at pumps only - 2-1/2" and larger shall be flanged, cast iron or semi-steel body, bronze trim, center guided lift check with bronze disc and stainless steel spring, 125 lb. S.W.P. 2" and smaller shall be screwed, bronze, cast iron or semi-steel body, bronze trim, center guided lift check with bronze or TFE disc and stainless steel or alloy spring, 125 lb. S.W.P.

D. Non-slam check valves at sewage ejector pumps only - 3" and larger, iron body, bronze mounted, horizontal swing check with bronze disc, outside lever and weight or spring, flanged, 125 lb. S.W.P.

E. Clow, McAlear, Mueller or Metraflex non-slam check valves are acceptable manufacturers as well as previously listed manufacturers.

F. When Victaulic piping is specified and utilized, Victaulic Style 711, 715, or 716 Check valves for piping 2" to 12" may be furnished at the Contractor's option.

2.12 Balancing Valves - 1-1/2" and larger to be cast iron body, bolted cover, permanently lubricated ball centric valves, with 175 lb. W.O.G. pressure rating. Furnish with wrench handle. Furnish with screwed connections up to and including 2-1/2" size, flanges for size 3" and larger. Valves as manufactured/provided by Watts, B & G, Homestead or DeZurik may be furnished at the Contractor's option.

2.13 Balance Fittings - 1-1/4" and smaller to be bronze construction, union body, straightway or angle pattern, with 175 lb. W.O.G. pressure rating. Fittings as manufactured/provided by Watts, B & G, Dunham-Bush/Webster, Thrush or Sarco may be furnished at the Contractor's option.

2.14 Combination Balance and Stop Valves – Spirax Sarco "Balance Master" globe valve with adjustable stop, bronze construction, screwed connections, and 300 lb. W.O.G. pressure rating. Similar valves (including plug types) as manufactured/provided by B & G, Watts, Illinois, Dunham-Bush/Webster, Homestead, or DeZurik may be furnished at the Contractor's option.

2.15 NATURAL GAS SHUT-OFF VALVES

A. 1-1/2" and smaller; class 150 brass/bronze construction, flat head, full port plug and washer with threaded connections.

B. 2" and larger; class 150 cast iron/steel body construction lubricated full-port plug with flanged connections. Furnish with lever handle operator.

C. Plug valves as manufactured/provided by Milliken, Stockton, Homestead or DeZurik may be furnished at the Contractor's option.

2.16 Access Doors to be furnished & installed by this contractor in accordance with general contract specifications.

PART 3 EXECUTION

3.1 This Contractor shall install all valves in strict accordance to the manufacturer's recommendations.

3.2 Where the Drawings call for both a shut-off valve and a balance valve or fitting, the Contractor may, at his option, furnish a combination balance and stop valve.

3.3 Where drain lines are not piped to floor drains, furnish hose end adapters. Provide cap & chain for all hose end adapters.

3.4 Spring loaded lift check type check valves are not to be provided for sewage ejector pumps.

3.5 Non-slam check valves shall be provided at all sewage ejector pumps, sump pumps and condenser water pumps.

3.6 Access doors to be located & installed to permit ready & un-obstructed access to associated valves, permitting full range of operation as well as service, maintenance & inspection.

3.7 Where a pressure regulator or reducing valve is indicated to be installed, an ASME listed pressure relief valve shall be installed in the downstream piping, set to relieve at 90 percent of the rated working pressure of the piping installation unless indicated otherwise.

END OF SECTION

SECTION 22 05 12

PIPING SPECIALTIES

PART 1 GENERAL

1.1 SCOPE

A. Furnish and install all necessary piping specialties to include thermometers, gauges, pipe strainers, etc., for piping systems included under this Contract.

B. Furnish & install access doors for piping specialties installed within or behind fixed structures such as drywall, plaster, gypsum, concrete, brick, etc. as required for access, maintenance & operation.

PART 2 PRODUCTS

2.1 Thermometers - Trerice "Industrial Type" red reading mercury thermometer with 9" cast aluminum case, front double- strength clear glass window, straight or angle pattern as required. Provide brass separable socket. Ashcroft, Marsh, Weiss or Palmer of the same type may be furnished at the Contractor's option. Ranges as indicated on the Drawings.

2.2 Pressure Gauges - Weiss 4PGA-l, standard single spring, aluminum case, 4-1/2" diameter with gauge cock and pigtail. Range as indicated. Trerice, Marsh or Ashcroft of the same type may be furnished at the Contractor's option.

2.3 Pete's Plug -

A. 1/4" MPT fitting to receive either a temperature or pressure probe, 1/8" O.D. fitting and caps shall be brass with valve core of Nordel, rated at 1000 psig. This Contractor shall furnish to the Owner the following:

1. Two (2) pressure gauge adapters with 1/8" O.D. probes.

2. Two (2) compound gauges, range 0-100 psi and 0-230 ft. hd. each.

3. Two (2) 5" stem thermometers, range -40°F to 160°F.

4. Two (2) 5" stem thermometers, range 25°F to 125°F.

5. Two (2) 5" stem thermometers, range 50°F to 500°F.

6 Two (2) 5" stem thermometers, range 0°F to 220°F.

B. Provide XL (extra long) type Pete's plug in insulated lines.

C. Sisco plugs may be furnished at the Contractor's option.

2.4 Strainers

A. Sarco style IF- 125 (flanged) or IT (threaded) 125 psig, Y-pattern, cast iron body with perforated brass screen for water. Threaded for 2- 1/2" and smaller, flanged for 3" and larger.

B. Armstrong, Mueller, Metraflex, or O.C. Keckley strainers may be furnished at the Contractor's option.

C. When Victaulic piping is specified and utilized, Victaulic Style 730 Tee type strainer for piping to 16" may be furnished at the Contractor's option.

2.5 Access Doors to be furnished & installed by this contractor in accordance with general contract specifications.

PART 3 EXECUTION

3.1 All specialties to be installed in accordance with manufacturer's recommendations.

3.2 All gauges and thermometers to be installed to be readable from floor without obstruction.

3.3 Provide structural cross-bracing as required to secure wall and panel mounted utility terminals and faucets in position, set true and square to mounting surface. Utility terminals to be secured with nipple/shank and back nut provided by the manufacturer. Cross bracing materials to comply with materials and methods in the partition specifications, installation coordinated with the partition contractor.

3.4 Access doors to be located & installed to permit ready & un-obstructed access to associated specialties, permitting full range of operation as well as service, maintenance & inspection.

END OF SECTION

SECTION 22 05 13

EXCAVATION & BACKFILL

PART 1 GENERAL

1.01 SCOPE

A. This Contractor shall excavate and backfill all trenches and other excavations required for installation of piping, pits, surface inlets, structures, interceptors, basins, vaults, etc. associated with work in this contract.

B. All work shall conform to the safety requirements, rules and regulations for the construction authorities and regulatory agencies, including the Federal Register Sections on Safety and Health and OSHA.

PART 2 PRODUCTS

2.01 BACKFILL MATERIAL

A. Earth Fill: Soil as approved by Architect and Soils Engineer, free of organic soil, sod, roots, wood, metal, rubbish, debris, lumps or excessive amounts of clay and rocks greater than 2” in diameter; capable of being compacted into dense and stable condition as specified.

B. Granular Fill:

1. Structural:

a. Coarse: Bank-run sand and gravel having uniform mixture of sand and gravel, capable of being compacted into dense and stable condition as specified, and free of organic soil, shale, lumps or excessive amounts of clay, and other foreign substances. NOTE: 100% of material must pass 2" sieve and have less than 25% passing #200 sieve as approved by Soils Engineer.

b Fine: "6X" by American Aggregates; a finely graded crushed stone and stone by-product from approximately 3/8" to 10-20% passing the #200 sieve. Material to be of low solubility as approved by Soils Engineer.

2. Slab Sub-Base: Provide under all interior concrete slabs on grade.

a. ODOT 703, Size #304 crushed or uncrushed stone.

b Surface choke with sand or fines to prevent damage to vapor barrier.

3. Drainage: ODOT 703, Size #467, washed and uniformly graded mixture of uncrushed gravel, with 100% passing a 2-inch sieve, and not more than 5% passing a #4 sieve.

C. Under Footings and Foundations: Concrete.

D. Around underground concrete, fiberglass or plastic Tanks, Basins, Interceptors and similar structures: Pea Gravel unless indicated otherwise by the equipment manufacturer.

E. Plastic Gas or Water Service Pipe. Soil free of large rocks, building materials, etc., that might cause damage to the plastic pipe.

PART 3 EXECUTION

3.01 EXCAVATION

A. Trench width shall be sufficient to permit proper installation of the pipe and bottom of trenches evenly graded to insure uniform bearing for pipe.

B. Trenches shall be sheathed or braced and pumping or bailing performed as necessary to protect workmen and adjacent structures and to permit proper execution of the work.

C. Bell and Spigot joint holes to be carefully excavated so that none of the load is supported by the bells or joints.

D. Mechanical excavation shall be held to 4" above final pipe elevation. The remainder shall be shaped by manual excavation, so that pipe is fully supported on undisturbed soil.

E. Excavations below required depths shall be refilled with sand or gravel firmly compacted. Rock encountered shall be excavated three inches (3") below the lowermost part of the pipe and the space so formed, refilled with sand and gravel well compacted. Refill shall be concrete under footings and foundations.

F. All lines below slab-on-grade floors to be bedded in coarse sand or pea gravel minimum 2" under pipe and 4" above.

G. Whenever in the opinion of the owner’s representative the soil at or below grade is unsuitable for supporting piping, equipment, or other construction included under this Contract, such provisions for proper foundations shall be made, in addition to those shown or specified, as the owner’s representative may direct. Equitable contract cost adjustment shall be provided in accordance with conditions encountered and additional provisions required.

3.02 TESTS AND INSPECTIONS

A. All required tests and inspections are to be approved by the Owner's Representative before any backfilling is done.

3.03 BACKFILLING

A. Backfill to rough grade within area of grading work required under General Contract, and to finish grade elsewhere.

B. Backfill shall be free of rubbish and boulders.

C. Tamp backfill in 6" layers to a point 24" above pipe; and 12" layers above this point. Backfill to be thoroughly compacted.

D. No frozen backfill shall be used.

E. Under footings and foundations, concrete backfill to extend one foot each side of footing or foundation.

F. Locations:

1. Under Building: Where additional excavation required or against footing sides where formed sides used; Granular, Fine Structural, to underside of slab sub-base.

2. Under All Interior Slabs: Provide 4" layer of slab sub-base; smooth and compact to specified density and leave ready for installation of vapor barrier.

3. Against Walls: Drainage fill.

4. Under Pavements:

a. Drives and Roads: Granular, Course Structural.

b. Walks: Granular, Course or Fine Structural.

5. Trenches: Granular, Fine Structural.

6. Site: Earth-Fill.

3.04 All pavements, curbs, walks and lawns damaged by this work shall be repaired by this Contractor to the original condition of same.

3.05 Protect all utilities shown on Drawings or encountered while doing work in this contract. Any damage to utilities shall be repaired by this Contractor to utility owner's satisfaction, without additional contract cost for this project.

3.06 Surplus earth shall be deposited on site where directed by the owner's representative.

3.07 Confirm & comply with the published installation requirements of all piping manufacturer's installation recommendations.

END OF SECTION

SECTION 22 05 14

PAINTING

PART 1 GENERAL

1.1 SCOPE

A. All un-painted steel supports and other structures provided for work in this contract shall have a minimum single coat of base primer provided after installation is complete. Elements provided with a manufacturer applied corrosion resistant finish are not required to be painted unless the finish has been removed, damaged or otherwise compromised.

B. All exposed metallic piping in areas other that designated mechanical or utility spaces shall have a minimum single coat of base primer provided after installation is complete.

B. Factory finished equipment & materials which have rusted or been damaged shall be cleaned at the completion of the project, including removal of rust spots and marred areas. These items shall be refinished and restored to the original finish condition.

PART 2 PRODUCTS

2.1 Primer shall be corrosion resistant epoxy base type listed for exterior applications in neutral gray or white color, and shall meet the applicable requirements of the general contract specifications for same including listing of acceptable manufacturers. Primer shall be listed for use with any & all materials it is applied to.

PART 3 EXECUTION

3.1 Elements to be painted to be cleaned & prepped in accordance with general contract specifications & the paint manufacturers recommendations in advance of application.

3.2 Coordinate & schedule application of primer with the general contractor when he is specified to provide finish painting.

END OF SECTION

SECTION 22 05 15

SLEEVES & COLLARS

PART 1 GENERAL

1.1 SCOPE

A. Sleeves shall be provided for all piping run through all new framed and/or poured/formed construction. Coordinate with fire-stopping requirements at all rated structures. This Contractor shall furnish sleeves for his work to the General Contractor for installation where directed, coordinated & scheduled in advance.

B. Sleeves are not required for openings core drilled through existing walls.

C. Finish collars/escutcheons shall be provided for all piping that penetrates structures (walls, ceilings, partitions, soffits, bulk-heads, floors, etc.) in “finished” areas accessible to the general building population.

PART 2 PRODUCTS

2.1 Sleeve material: black steel pipe, machine cut, large enough to allow l/4" clearance all around pipe (around pipe covering on insulated piping). Use machine cut copper sleeves for un-insulated copper pipe.

2.2 Sleeves passing through fire rated walls or floors to be in accordance with “FIRE-STOPPING” requirements listed herein.

2.3 Collars/escutcheons to be pipe friction-fit convex brass with a polished chrome finish.

PART 3 EXECUTION

3.1 Sleeves in partitions to have length equal to the thickness of finished partitions. Sleeves in floors of finished areas to project l/8" above finished floor. Sleeves in floors of non-finished areas shall project 3" above finished floor. Fill space between pipe and sleeves into exposed areas with sealing compound. Ream all sleeves before installing.

3.2 Sleeves in floors of all Mechanical/Electrical Rooms receiving a membrane floor to project 6" above floor to receive the membrane base.

3.3 Where pipes pass through fire rated walls or floors, sleeves shall comply with “FIRESTOPPING” requirements listed herein.

3.4 Sleeves to be set in forms prior to pour in concrete structures; and in framing structure as partitions are being built.

3.5 Collars/escutcheons for pipe penetrations to be of adequate size to completely cover & conceal the rough wall opening & be final set tight to structure.

3.6 Cutting required of any masonry wall or floor after it is in place shall be done by core drilling.

3.7 Piping is not allowed to bear on sleeves.

3.8 Sleeves shall be installed plumb and true to line, grade, and position.

3.9 Unused sleeves shall be plugged and finished to match adjacent surface.

END OF SECTION

SECTION 22 05 18

INSERTS, PIPE HANGERS & SUPPORTS

PART 1 GENERAL

1.1 SCOPE

A. Furnish and install all necessary inserts, beam clamps and auxiliary steel for pipe hangers in the building.

B. Furnish and install necessary pipe hangers and supports to properly support all piping and to maintain uniform elevation.

C. Piping & equipment to be installed & supported in accordance with Building Code requirements applicable to the site seismic classification. This includes but is not limited to restraints, sway-bracing, isolation, etc. Seismic classification to be as indicated by project data included with the complete construction package.

D. The use of power-driven anchors is expressly prohibited. Power-driven anchors are defined as anchors which are driven into place by any device which produces an impact force by use of a powder charge, compressed air, gas, or other propellant.

E. Piping, equipment & other elements in this contract to be installed in strict accordance with the manufacturers' guidelines & recommendations for support, confirmed by the contractor in advance of all work.

PART 2 PRODUCTS

2.1 HANGERS

A. Hangers for direct attachment to copper lines 2" size and smaller shall be similar to Anvil Figure CT-99 adjustable carbon steel pipe ring with copper plating & support rod.

B. Hangers for direct attachment to copper lines 2-1/2" to 4" size shall be similar to Anvil Figure CT-65 adjustable carbon steel clevis with copper plating & support rod.

C. Hangers for direct attachment to copper lines 6" size & larger shall be similar to Anvil Figure 260 adjustable carbon steel clevis with dielectric sleeve/protection & support rod.

D. When copper lines are insulated and hangers are sized for outside of insulation, provide steel hangers as described below.

E. Hangers for steel lines 2" size and smaller shall be similar to Anvil Figure 97 adjustable carbon steel band pipe ring with support rod.

F. Hangers for steel lines 2-1/2" size and larger shall be similar to Anvil Figure 260 adjustable heavy duty carbon steel clevis with support rod.

G Hangers for domestic cold water and storm piping shall be sized for outer diameter of insulation cover run continuous through the hanger. Furnish half-round galvanized sheet

metal protectors similar to Anvil Figure 167 for piping 1-1/4" and larger with run-through insulation cover.

H. Horizontal drain, soil, waste & vent pipe to be supported using Anvil Fig. 260 adjustable carbon steel clevis with support rod.

2.2 Trapeze hanger assemblies to be listed steel “C” channel similar to Anvil Strut with integrated pipe clamps & all thread support rods. Provide protective grommet/liner for clamp attachment to exposed piping. Support rod sizing to be in accordance with the channel manufacturer’s recommendations for the applicable piping quantities & sizes at each installation.

2.3 Wall brackets to be similar to Anvil figure no. 195.

2.4 Riser clamps to be similar to Anvil figure no. 261. Clamps in direct contact with copper piping to be Anvil figure no. CT-121C with dielectric protection coating.

2.5 Hanger support rods to be listed all-thread type sized in accordance with the hanger manufacturer’s recommendations for associated piping.

2.6 Clamps & inserts to be listed assemblies provided by the hanger manufacturer for the corresponding support rod size.

2.7 Where steel hangers are installed at building exterior locations they are to be provided with a manufacturer applied corrosion resistant galvanized finish for the entire hanger assembly, including nuts, clamps and rods. This includes hangers installed at open parking areas, building overhangs and any other similar areas.

2.8 Hangers, supports & accessories as manufactured/provided by Anvil, B-Line, Michigan, PHD Manufacturing, Erico or Modern Pipe Hangers may be furnished at the Contractor's option.

PART 3 EXECUTION

3.1 Piping shall only be independently supported from building primary structure in an approved manner & in accordance with best construction practices. Piping shall not be supported from or bear on non-load bearing structures, equipment, fixtures, building elements, other piping, or work of other trades. Piping shall not be used as a support for any other elements.

3.2 Piping shall not be supported from or attached to any structure in such a manner as to compromise or weaken said structure. All structural attachment devices shall be listed for such service & installed in accordance with the manufacturer’s guidelines & recommendations.

3.3 Support vertical supply, return, drain & vent piping at 10 feet on center for copper & plastic piping, 15 feet on center for cast iron & steel piping. Pipe clamps shall be provided at each stack & riser structural floor penetration.

3.4 Wall bracket pipe supports shall be installed where required.

3.5 All copper piping is to be shielded from direct contact with steel or any other corrosive reaction materials with approved dielectric protection.

3.6 Steel hangers are not permitted for direct contact support of copper lines. Steel hangers may be used for support of insulated copper lines when specified to be at the exterior of the insulation cover.

3.7 Horizontal soil, drain, waste & vent pipe (including storm and sanitary systems):

A. Support within 18” of each joint (hub side of hub & spigot piping), at each p-trap, at base of each riser, at each floor penetration and elsewhere as required.

B. Where multiple joints are installed in horizontal piping 48” in linear run length or less, provide a hanger at every other joint.

C. See sanitary waste & vent and storm drain piping sections for sway bracing and restraint requirements.

D. No-hub piping 10” size & larger in ten foot lengths shall have hangers provided within 18” on both sides of each coupling.

E. Plastic piping shall be supported at maximum 4 feet on center spacing in addition to other conditions listed.

F. Piping shall be installed according to the pipe manufacturer’s specifications & recommendations including support, bracing & restraint. Sanitary drain piping support spacing shall be based on 140 degrees F water temperature.

3.8 Horizontal steel pipe to be supported at intervals of not over 10 feet, copper at intervals of not over 8 feet, and at base of each riser. Support elsewhere as required in accordance with good workmanship. No pipe shall be supported from another pipe.

3.9 Support horizontal plastic supply piping at intervals not to exceed 4 feet on center.

3.10 Support piping at pumps and equipment from floor, ceiling, or walls, so that piping weight is not supported directly from pumps or equipment.

3.11 Piping at equipment and control valves, etc. shall be supported so that those elements/items can be removed without providing additional support elements. Piping shall not introduce any strains or distortions on connected equipment.

3.12 Piping shall be installed according to the pipe manufacturer’s specifications & recommendations including preparation, joining methods, allowances for expansion/contraction, bedding, backfill, support & restraint.

END OF SECTION

SECTION 22 05 19

DRAINS, CLEANOUTS & DRAINAGE SPECIALTIES

PART 1 GENERAL

1.1 SCOPE

A. Furnish and install drains, cleanouts and drainage specialties as indicated on plans, and elsewhere as required for complete drainage, access and special function/operation at all items/elements and areas requiring same, and for proper integration with the building drainage systems.

B. Unless indicated otherwise, all items/elements and their component parts described herein to be of metallic construction when such is available for the base specified item/element. Use of plastic, composite, or other non-metallic components and/or materials by listed alternate items/elements is prohibited

C. All drain inlets and piping receiving waste water from equipment in excess of 120 degrees F to be metallic type material as specified herein rated for 180 degrees F water temperature to a minimum 100 LF from the drain inlet terminal. This includes but is not limited to drains serving kitchen/food service and laundry equipment.

PART 2 PRODUCTS

2.1 DRAINS AND DRAINAGE SPECIALTIES; as specified on plans.

A. Furnish and install a P-trap for each sanitary drain inlet terminal (floor drain, hub drain, floor sink, etc.) of the same material and connection type as the piping system connected to, unless indicated otherwise.

2.2 CLEANOUTS; as specified on plans.

A. This contractor may, at his option, use ABS plastic plugs in lieu of bronze plugs where specified, except ABS plugs shall not be permitted in return air plenums or at exposed locations. Location of return air plenums to be confirmed with the HVAC contractor.

B. All cleanouts installed in carpeted areas to be provided with approved vandal-proof carpet markers. Carpeted areas to be as indicated by Architectural documentation, and confirmed with the General contractor.

C. Cleanouts in tile, marble, terrazzo, par quay or other “special” floor treatment areas to be provided with recessed tops to allow integration with floor treatment. “Special” floor treatment areas to be as indicated by Architectural documentation, and confirmed with the General contractor.

2.3 Equal drains, drainage specialties and cleanouts as manufactured by Zurn, Mifab, Josam, Wade, Watts or J.R. Smith may be furnished at the contractor's option.

2.4 Equivalent continuous trench drain assemblies as manufactured by ACO, Mifab, ABT, Quazite, or any of the manufacturer’s listed herein for drains and cleanouts may be furnished at the contractor’s option.

2.5 Equal concrete body interceptors as manufactured by E.C. Babbert, O.C. Adams or Mack Vault may be furnished at the contractor's option.

PART 3 EXECUTION

3.1 When trap primer water supply is indicated on plans for drain assemblies, the Contractor has the option to connect to a fitting on either the drain assembly or the P-trap inlet above the water seal, in accordance with inspection/approval authorities. Provide a dielectric union at trap primer supply connection points. When drain body primer connections occur within the slab/floor structure, provide an offset immediately adjacent to the drain location to allow installation of supply piping entirely below the slab/floor structure, including the conduit sleeve required for trap primer supply piping under slab on grade.

3.2 Provide a compatible fastening assembly with internal secondary drainage flange and weep-holes for all items specified herein being installed in structures having a waterproof membrane, flashing, vapor barrier, or similar element provided under separate contract. Installation conditions to be verified from Architectural documentation and coordinated with the appropriate contractor.

3.3 Counter-flashing (when required) for items specified herein shall be compatible with waterproof membrane, vapor barrier, flashing, or similar elements provided under separate contract at the interface point. Counter-flashing to be provided and set in place by the Plumbing Contractor, but will be made watertight by the Contractor installing the membrane, vapor barrier, flashing or similar elements provided under separate contract. Installation conditions to be verified from Architectural documentation and coordinated with the appropriate contractor.

3.4 This Contractor shall be responsible for having all drains, cleanouts and other items so noted installed flush and level with finish wall, floor or other structure as applies. Coordinate installation with Contractor’s providing associated structure, including required elevations and dimensional locations. Items not properly installed shall be removed and replaced to the satisfaction of the Owners’ on-site representative.

3.5 All items and accessories specified herein are to be installed in accordance with the manufacturer’s recommendations, and in accordance with the requirements of the inspection/approval authorities.

3.6 All underground tanks, basins, interceptors, etc. to be filled with water as soon as practical after installation to prevent shifting and/or flotation. When such items are to be integrated with concrete slab construction, furnish with an appropriate flange or framing assembly to anchor in structure.

3.7 Coordinate location of all drains as required for proper operation when associated with sloped floors, roofs, decks or other structures provided under separate contract.

3.8 Verify exact locations of drains furnished for items under separate contract with the equipment as actually provided and installed by the appropriate Contractor. Coordinate installation in advance of work.

3.9 With the exception of cleanouts, all items specified are to have connection size same as connected piping size shown on plans, unless directed otherwise.

3.10 Cleanouts are to have outlet size, connecting pipe and fittings of same size as shown on plans for waste/drain piping being served, up to and including 3” size. Cleanouts are to have outlet size,

connecting pipe and fittings of 4” size when shown on plans serving waste/drain piping 4” size and larger.

3.11 Coordinate locations of items specified herein, and installed in or at structure provided under separate contract, relative to foundations, beams, and other structural elements to avoid conflicts. Make minor adjustments as required for proper installation, clearance and accessibility. Refer to Architectural/Structural documentation in advance of work and coordinate installation with the appropriate contractor.

3.12 All items/elements specified that are to be integrated into above grade structures shall be furnished with an anchor flange, when such is available. Secondary drainage flange at drain assemblies may also serve as an anchoring flange, subject to approval.

END OF SECTION

SECTION 22 05 20

CUTTING & PATCHING

PART 1 GENERAL

1.1 SCOPE

A. Cutting for all openings in structures, framing or other elements required for installation of work in this contract shall be done by this contractor with appropriate tools and methods as to prevent unnecessary damage to surrounding areas or equipment.

B. Unless indicated otherwise patching for all openings left in structures after existing plumbing elements have been removed shall be done by this contractor to match adjacent structure in type, kind & finish.

PART 2 PRODUCTS

2.1 Patching & repair of structural elements to be done with listed compatible materials & methods in accordance with general contract conditions for specific types of structure when applicable.

PART 3 EXECUTION

3.1 Avoid cutting of concrete, masonry and other new work by the use of inserts and sleeves.

3.2 All holes in existing walls and floors shall be cut by use of core drills, using water to keep down the dust, and a method for catching water shall be provided. In addition, a vacuum cleaner shall be used with inlet as close to the hole being drilled as possible to pick up all dust caused by drilling.

3.3 The corners of all openings in poured concrete shall be core drilled to minimize over-cutting.

3.4 Openings in rated structures shall be filled or patched in such a manner as to maintain the appropriate rating including fire-stopping if necessary.

3.5 The Protection of Persons and Property Section of the General Conditions must be followed without exception, including precautions against Fire Hazards.

3.6 No structural member will be cut without the expressed permission of the Owner's Representative obtained in advance.

END OF SECTION

SECTION 22 05 21

ELECTRICAL WORK

PART 1 GENERAL

1.1 SCOPE

A. This Contractor shall furnish all motors for his equipment. Motor starters, disconnects, safety switches and wired junction boxes shall be furnished and installed by the Electrical Contractor except where specifically specified to be furnished with certain mechanical equipment.

B. WORK INCLUDED - This Contractor; all 120V & low voltage internal system & equipment control wiring unless otherwise specified.

C. WORK INCLUDED - Electrical Contractor; all external power wiring.

D. SHOP DRAWINGS; the Contractor shall furnish to the Electrical Contractor, equipment shop drawings which will indicate power hook-up and control connections as required for mechanical equipment. "Stock" Wiring Diagrams are Not Acceptable.

PART 2 PRODUCTS

2.1 Refer to “Energy Code” requirements referenced herein (Particularly power factor correction).

2.2 Refer to & comply with the Electrical Division of these specifications for specific elements to be used in this contract and listed therein, including low voltage wiring, conduit, appurtenances and accessories.

2.3 All single-phase motors provided by this Contractor to have built-in thermal overload protection.

2.4 Motor starters, contactors, and disconnects are provided and installed by the Electrical Contractor, unless part of packaged equipment furnished by this Contractor, or otherwise specified.

PART 3 EXECUTION

3.1 All wiring, conduits, etc., shall be in strict accordance with the requirements of the latest edition of the National Electrical Code and Division 16, Electrical specification.

3.2 All wiring, including low voltage wiring, shall be run in conduit.

3.3 Low voltage wiring may be size and type recommended by the Equipment Manufacturer provided it does not conflict with any Code requirements or conditions.

END OF SECTION

SECTION 22 05 30

TESTS & ADJUSTMENTS

PART 1 GENERAL

1.01 SCOPE

A. After work has been completed but before pipe covering has been applied, the Contractor shall test and adjust the systems he has installed.

B. The Owner's Representative shall be notified of all scheduled tests and adjustments at least 48 hours before they are scheduled so that he may witness same. If the Contractor performs any test or adjustment without the Owner's Representative present or without properly notifying the Owner's Representative, the Contractor will be required to perform the test or adjustment a second time in the presence of the Owner's Representative.

C. If the Owner's Representative determines that any work requires special inspection, testing, or approval, he will, upon written authorization from the Owner, instruct the Contractor to order such special inspection, testing or approval. The Contractor shall give timely notice so the Owner's Representative may observe the inspections, tests or approvals. If such special inspection or testing reveals a failure of the work to comply with the requirements of the Contract Documents, the Contractor shall bear all costs thereof, including compensation for the Owner's Representatives additional services made necessary by such failure; otherwise the Owner shall bear such costs, and an appropriate Change Order shall be issued.

D. Concealed lines shall be tested before being concealed. If this is not done and a leak occurs during the final test, this Contractor shall repair leak and all damage resulting there-from.

E. This Contractor shall adjust all his equipment in the plumbing system to obtain proper operation and shall demonstrate to the Owner's Representative that the entire system will function properly.

PART 2 PRODUCTS

Not applicable.

PART 3 EXECUTION

3.01 TESTS

A. After work has been completed but before pipe covering has been applied, the Contractor shall test the systems as follows. At these pressures, circulation shall be unrestricted and the piping system free of leaks.

System	Test Medium	Pressure Not Less Than	Time Not Less Than	Notes
Domestic Water Piping	Per code(s) specified in “Plumbing General” section.			
Drainage systems	Per code(s) specified in “Plumbing General” section.			
Natural Gas	Per code(s) specified in “Plumbing General” section & as specified in gas piping section			

3.02 Purge natural gas system to outdoors. Purge and test to be witnessed by Gas Company and Owner’s Representative.

3.03 This Contractor, after all equipment, outlets, piping and accessories have been installed, shall properly balance, adjust & activate all water systems, record all final data, prepare a detailed report and submit the report, in triplicate, to the Owner’s Representative for review. Each copy of the report shall be dated, signed by an officer or partner in the firm and bound in a suitable cover. Where Pete's Plugs & balance/stop valves are installed, the report shall include pressure drop readings to confirm flow rates.

3.04 Domestic hot water return systems (when provided) shall be final adjusted & balanced for a nominal 10 degrees water temperature differential. When installation of the domestic hot water supply and return system is completed it shall be set in operation for balancing. Water flow thru each balancing valve shall be determined by pressure differential gauging or direct reading. When multiple hot water return branches are provided, the system shall be balanced to provide overall flow evenly proportioned between the individual branches. Prepare test report with pertinent design data for turn-over to the owner on project close-out. For systems with multiple hot water return branches, associated balance valves shall be numbered in the test report in sequence starting at pump to end of system.

3.05 This Contractor shall check for proper alignment before starting any pumping unit with pump and driver mounted on a common base plate with flexible pipe couplings.

3.06 Before turning job over to Owner this Contractor inspect all valves and repack valves as necessary.

3.07 This Contractor shall adjust all equipment in the plumbing system to obtain proper operation and shall demonstrate to the Owner’s Representative that the entire system will function properly.

END OF SECTION

SECTION 22 05 31

FLUSHING & STERILIZATION

PART 1 GENERAL

1.1 SCOPE

A. Flush out all domestic water piping systems to remove all dirt, debris, grease & any other foreign matter from pipes and equipment before systems are placed into operation. Clean strainers after each flushing until the strainer remains clean.

B. After domestic water lines are all installed, sterilize lines, including outside services as prescribed by AWWA-C-651. Sterilization shall be done under the immediate on the job supervision of a water testing laboratory regularly engaged in the service and shall be done per their instructions. All fees for testing and test equipment shall be paid by this Contractor.

C. Furnish a Certificate of Sterilization and Approval For Human Consumption signed by a Professional Engineer registered in the State of Ohio regularly in the employ of the Testing Laboratory. Certification shall be furnished to the owner's representative before payment will be made.

PART 2 PRODUCTS

2.1 Sterilization: Chlorinating material either liquid chlorine meeting AWWA Standard B30l, sodium or calcium hypochlorite meeting AWWA Standard B300.

PART 3 EXECUTION

3.1 With all outlets closed, fill system to working pressure and close valve at supply main.

3.2 A cleaning solution containing not less than 150 parts per million of chlorine shall be introduced into the system.

3.3 Each outlet, hot and/or cold, shall be tested during fill to prove the presence of chlorine at that outlet and valves and faucets shall be opened and closed several times during the disinfecting time period.

3.4 Water piping systems shall remain filled for a period of 24 hours and each outlet shall be again tested and shall produce not less than 100 parts per million of chlorine at the end of the retention period.

3.5 All outlets shall be opened wide and the main supply valves opened, flushing system with water until chlorine content is not greater than 0.2 parts per million or until approved by the Health Department. Flush drain valves.

3.6 After final flushing all aerators on plumbing brass shall be removed, cleaned and reinstalled.

3.7 Sterilization test may be performed at the same time the pressure test is placed on the system.

END OF SECTION

SECTION 22 05 40

VALVE TAGGING PIPING IDENTIFICATION

PART 1 GENERAL

1.1 SCOPE

A. Provide identification tags on all valves.

B. Provide identification markers for all piping, except that piping which is within inaccessible structure.

PART 2 PRODUCTS

2.1 Valve tags shall be 16-gauge brass with minimum 2" diameter & brass or stainless steel chain permanently attached to valve. Tags shall state type of line in which the valve is installed (domestic cold water supply, domestic hot water supply, natural gas supply, compressed air supply, vacuum return, etc.) and a unique alpha/numeric identification for each valve.

2.2 Piping markers similar to Seton Setmark semi-rigid plastic type.

A. Direction of flow arrows are to be included at each marker.

B. Each marker background shall be appropriately color coded with a clearly printed legend to identify the contents of the pipe.

C. Snap-around markers shall be used for overall diameters up to 6" and strap-around markers shall be used above 6" overall diameters.

PART 3 EXECUTION

3.1 Furnish a printed text schedule or schedules for all valves with type (ball, gate, check, OS&Y, etc.) identification, location and purpose of each valve, framed & mounted under glass on wall at location approved by the owner's representative. A copy of this schedule or schedules shall be included in the operations & maintenance manuals.

3.2 After piping is installed (and painted or provided with insulation cover as applicable); this Contractor shall then install piping identification markers. Flow direction arrows of the same colors are to be located adjacent to the Identification Legends. Pipe identification spacing shall be provided at maximum 20 feet on center, at each branch connection, at each riser, and at least once in each room. Do not use adhesive markers. Colors as follows:

A. Yellow - Dangerous materials
B. Green - Safe materials
C. Blue - Protective materials.

END OF SECTION

SECTION 22 05 41

EQUIPMENT IDENTIFICATION

PART 1 GENERAL

1.1 SCOPE

A. This Contractor shall label all primary equipment furnished under this Contract. This included but is not limited to pumps, sewage ejectors, sump pumps, water heaters, water treatment equipment, etc. Packaged equipment shall be identified as a single item without identification for individual components such as duplexed pumps.

PART 2 PRODUCTS

2.1 Identification labels shall be 1/l6" thick laminated plastic or 0.020" thick aluminum name-plates. Background shall be black with 3/l6" letters engraved on the face. Letters shall be white or natural aluminum.

PART 3 EXECUTION

3.1 Permanently secure identification plates to equipment with non-corrosive screws or epoxy adhesive listed for use with all materials. Locate where clearly visible, and in such a manner as to not impair or damage equipment.

3.2 Furnish a schedule or schedules of all equipment with type (water heater, pump, etc.) identification number/letter & location of each item and mount under glass on Equipment Room wall, or elsewhere as required. A copy of this schedule or schedules shall be included in the operations & maintenance manuals.

END OF SECTION

SECTION 22 05 50

DEMOLITION

PART 1 GENERAL

1.01 SCOPE

A. This Contractor shall be responsible for removal of and modifications to the existing plumbing installation including equipment, fixtures, piping & other elements as herein noted and as shown on the Drawings. Unless indicated otherwise all elements removed and not reused in remodeling shall become the property of this Contractor and be promptly removed from the site.

B. The General Contractor shall be responsible for all plumbing demolition in all areas that will be renovated as part of this project. Refer to the demolition Drawings and demolition notes. The plumbing contractor shall be responsible for equipment plumbing utility disconnects and coordination with the general contractor to identify the equipment, piping, etc that is to be removed.

C. This Contractor shall remove existing piping, equipment and appurtenances, etc., as shown on the Drawings and as specified. Equipment to be removed includes but is not limited to the following:

1. Water Closets (2)

2. Lavatories (2)

3. Mop Sink (1)

4. Hose Bib (1)

PART 2 PRODUCTS

Not applicable.

PART 3 EXECUTION

3.01 Unless indicated otherwise this contractor shall be responsible for removing all structures & other elements as required for execution of work in his contract. This includes fixed structures (drywall, plaster, concrete, etc.) requiring cutting, removal, disposal & repair; & accessible structures (lay-in ceiling grids & tiles, etc.) requiring removal, storage & re-installation on completion of the plumbing installation. Care shall be taken with removal & storage of accessible structure components to ensure re-installation to original condition. Any elements damaged during removal, storage or re-installation must be replaced by this contractor at his expense.

3.02 All waste materials associated by the demolition process shall be removed & clean-up performed by this contractor in accordance with general conditions of construction.

3.03 All work in this contract to be done in such a manner as to maintain or minimize interruption of plumbing utility service to the portion of the structure remaining occupied, active & in-use during regular business hours while construction is underway. This includes scheduling & performing work after normal building operation hours when required as a condition of work.

3.04 Any plumbing systems shut-down, interruption, impairment or removal from service associated with work in this contract shall be scheduled & approved in advance with the owner's representative.

End of Section

SECTION 22 05 60

MANUFACTURERS DRAWINGS

PART 1 GENERAL

1.1 REFERENCE

A. Applicable Division 1 and General Conditions terms and conditions (if any).

1.2 GENERAL CONDITIONS

A. Unless directed otherwise by the Construction Administration portion of the specifications this Contractor shall provide (6) copies of manufacturers submittal data for specific plumbing equipment, fixtures & materials to the Owner's Representative for review within six weeks after the date of contract. This data shall include performance information, wiring diagrams, utility requirements & any other pertinent information necessary for appropriate evaluation. The Owner's Representative will review the Contractor's submittal data for compliance with project specifications & the ability of the associated elements to be furnished & installed as a properly functioning integral element of the overall plumbing installation. Before providing a submittal to the Owner's Representative the Contractor shall:

1. Review each such submission for conformance with the means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto, all of which are the sole responsibility of the Contractor.

2. Approve each submission & so stamp in advance of forwarding to the Owner's Representative.

B. The required submittals are as follows:

1. Plumbing fixtures and all trim
2. Electric water coolers
3. Disposers/garbage grinders
4. Drains, cleanouts & drainage specialties
5. Sewage ejectors & accessories
6. Domestic water booster pumps
7. Water heaters, storage tanks & accessories
8. Domestic hot water re-circulating pumps
9. Mixing valves
10. Interceptors
11. Hose bibbs
12. Trap primer valves & accessories

C. The Owner's Representative shall return shop drawings and related materials with comments provided that each submission has been called for and is stamped by Contractor as indicated above. The Owner's Representative shall return without comment material not called for or which has not been approved by Contractor.

D. This Contractor shall furnish equipment shop drawings which will indicate power hook up and control connections as required for mechanical equipment. "Stock" wiring diagrams are NOT ACCEPTABLE.

E. The manufacturer shall provide a statement on submittals that equipment furnished complies with the Ohio Energy Code. This previously relates to high efficiency motors, EER's, COP's, etc. If this is not done, submittals will be rejected.

F. Owner's Representative review of manufacturer's drawings or schedules shall not relieve the Contractor from compliance with the requirements of the plans and specifications.

G. Items may be referred to in singular or plural on Plans and Specifications. Contractor is responsible for determining quantity of each item.

PART 2 PRODUCTS

Not applicable.

PART 3 EXECUTION

3.1 Refer to the Construction Administration portion of the specifications & the owner's representative for specific direction in regard to processing submittals for the project, including procedures, time-tables, quantities, routing & approved format.

END OF SECTION

SECTION 22 07 00

PLUMBING INSULATION

PART 1 GENERAL

1.1 SCOPE

A. Provide listed insulation cover for all items/elements as specified herein, as shown on plans; and for any other items/elements requiring same.

B. Insulate piping and associated accessories and appurtenances included in the following systems:

1. Domestic cold water.
2. Domestic hot water.
3. Domestic hot water return.
4. Tempered water (full temperature range).
5. Horizontal portions of interior above grade storm water drain, adjacent elbows at all transitions to/from vertical, and bottom of all above grade storm water drain inlets.
6. Horizontal portions of building above grade sanitary water drain, adjacent elbows at all transitions to/from vertical, traps, and bottom of all above grade sanitary drain inlets receiving low temperature (60 degrees F. or less) discharge from HVAC elements provided under separate contract.

PART 2 PRODUCTS

2.1 All insulating materials, including jackets, cements, adhesives, vapor barriers, etc., shall be U.L. listed, with a flame spread rating not to exceed 25, and a smoke development rating not to exceed 50. All exterior finishes shall have a minimum service temperature limit (FSTM 70) of minus 50 to 220 degrees F.

2.2 Molded plastic fitting covers shall be U.L. listed, with a flame spread rating not to exceed 25, and a smoke development rating not to exceed 50.

2.3 Insulation thicknesses are based on insulation having thermal resistance in the range of 4.0 HR F ft^2/Btu to 4.6 HR F ft^2/Btu per inch of thickness on a flat surface at a mean temperature of 75°F. Minimum insulation thickness shall be increased for materials having R values less than 4.0 or may be reduced for materials having R values greater than 4.6 to give equivalent "R" values.

2.4 Fiberglass insulation pipe cover shall be similar to Johns Manville "Micro-Lok", rated for 850 degrees F., with a factory applied AP-T all-purpose self-sealing vapor barrier jacket. Butt strips shall be minimum 3" wide, and of same material as jacket. Equal materials, including thickness and conductivity ratings/listings, as manufactured by Owens Corning, Knauf or Manson may be furnished, at the contractor's option.

2.5 Where insulation thickness is indicated for cover herein, it is the nominal MINIMUM required thickness.

2.6 For fiberglass cover, all cements, adhesives, finishes, and associated materials shall be similar to that provided by Foster. Equal materials as provided by Childers or Vimasco may be furnished at the contractor's option.

PART 3 EXECUTION

3.1 Provide fiberglass cover for cold water, storm and sanitary piping; and bottom of storm and sanitary drain inlets as follows:

A. Cover with minimum 1/2" thickness insulation.

B. Butt all edges of insulation and seal all longitudinal laps and butt strips with white vapor barrier cement, similar to Foster no. 85-20; or furnish with manufacturer's integral self-sealing laps.

C. Fittings and mechanical couplings shall be wrapped with compressed fiberglass to same thickness and density as adjacent pipe covering, and covered with a listed molded plastic fitting.

D. All appurtenances and accessories such as valves, flanges, unions, etc. installed in referenced piping (with the exception of backflow prevention assemblies) shall be wrapped with full thickness insulation and covered with a listed molded plastic fitting cover; or an open mesh glass cloth shall be applied over wet mastic, and covered with a second coat of fire-resistant mastic. Backflow prevention assemblies which require periodic inspection/testing/maintenance shall not be provided with insulation cover, unless these assemblies are in water sensitive locations, such as above lay-in ceilings. If listed backflow prevention assemblies are in water sensitive locations, furnish cover complying with this specification that allows removal and replacement as necessary for required access. Insulation cover at valves & other operable components shall be done in such a manner as to allow proper access & full range of operation.

E. Use 12" long sections of calcium silicate rigid insulation, with jacket same as adjacent pipe covering for transfer of support to piping at each hanger, without stress to the pipe covering assembly. At the contractor's option, an approved wood or high-density (20 lb./cubic foot) fiberglass block may be substituted for the rigid insulation section. Vapor barrier to be maintained throughout.

3.2 Provide fiberglass cover for hot water, hot water return, tempered water piping as follows:

A. Cover with minimum 1" thickness insulation.

B. Butt all edges of insulation and seal all longitudinal laps and butt strips with white vapor barrier cement, similar to Foster no. 85-20; or furnish with manufacturer's integral self-sealing laps.

C. Fittings and mechanical couplings shall be wrapped with compressed fiber glass to same thickness and density as adjacent pipe covering, and covered with a listed molded plastic fitting.

D. All appurtenances and accessories such as hangers, valves, flanges, unions, etc. installed in referenced piping shall not be covered. Cover shall be interrupted to allow direct hanger support of referenced piping. All insulation cover termination points shall be stopped with an even flat surface perpendicular to piping, sealed with Foster "Tight-Fit" coating.

3.3 Where valves are specified or installed with insulation cover it shall be applied in such a manner as to permit full range of operation without restriction or damage to the covering.

3.4 All applications shall be made on clean, dry surfaces with all joints butted firmly together.

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3.5 Insulation must run continuous through hangers, sleeves and walls for all storm, sanitary and cold water piping.

3.6 On all piping 1 ¼" diameter and larger with insulation cover specified to run continuous through hanger assemblies, provide a listed/approved sheet metal protective insulation shield at each hanger.

3.7 Insulation is not required for the following:

A. Supply branch run-outs to individual fixtures 24" or less in length.

B. Piping which is underground and/or below slab on grade structure.

C. CPVC hot and cold water piping that meets current energy code thermal resistance requirements for heat loss per the manufacturers published documentation.

3.8 Insulation shall not be applied until general construction has progressed sufficiently to minimize potential for physical or moisture damage to the cover assembly. All damaged cover shall be replaced at the contractor's expense.

3.9 Install protective sleeve as specified in section 22 05 15 on all insulated, exposed pipes penetrating floor structure.

3.10 Hanger rods must be perpendicular before insulation is installed.

3.11 Longitudinal lap joints and butt strips for fiberglass piping insulation shall be secured with staples on three (3) inch centers, and sealed with an approved vapor barrier adhesive where applicable. Staples are not required when insulation utilizes a "double" adhesive self-sealing system.

END OF SECTION

SECTION 22 11 16

DOMESTIC WATER PIPING SYSTEMS

PART 1 GENERAL

1.1 SCOPE

A. Provide a complete domestic water supply & return piping system as shown on plans and as necessary to serve all items/elements requiring same.

B. The domestic water piping system shall include, but not be limited to the following:

1. Cold water supply
2. Hot water supply
3. Hot water return
4. Tempered water supply (full temperature range)
5. Trap primer supply
6. Domestic water make-up supply to elements provided under separate contract, such as HVAC equipment/systems, ponds/pools, irrigation systems, etc.

C. All elements specified herein and/or indicated on plans with components/parts in contact with the potable water medium shall be listed for such service, in accordance with referenced code requirements.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

A. Above ground piping up to and including 6" size:

1. Type L hard drawn copper tube with wrot copper fittings and socket solder joints and connections. 3" & larger size joints & fittings to be brazed. Tee drill mechanical saddle connections may be utilized for branch take-offs, provided they are listed/approved extruded type, in compliance with the requirements of all review, inspection and approval authorities, confirmed by the Plumbing Contractor in advance. Completed installation to be rated for 125 psig working pressure.

2. Type L hard drawn copper tube with roll grooved gasketed mechanical couplings similar to Victaulic style 607, rated for 300 psig working pressure.

3. Piping larger than 4" size may be schedule 40 galvanized steel pipe and fittings with class 125 flange and gasket connections. Completed installation to be rated for 175 psig working pressure.

4. At Contractors option plenum rated ASTM & NSF listed schedule 80 CPVC pipe with socket solvent weld pressure fittings may be utilized.

   a. Hangers and supports for all CPVC tubing shall be spaced at 1/2 the Manufacturer recommended spacing to provide greater support and restrict sagging/settling of piping after installation.

5. Where the shut-off discharge pressure from a booster pump plus the incoming water supply suction pressure exceeds 125 psig, one of the following piping types shall be used:

   a. Schedule 40 ASTM A53 steel with class 250 fittings, rated for 300 psig working pressure. All elements to be provided with manufacturer applied galvanized finish.

   b. Type K hard drawn copper tube with roll grooved gasketed mechanical couplings similar to Victaulic style 607, rated for 300 psig working pressure.

   c. This shall apply to piping to the inlet of pressure reducing/regulating assemblies set to maintain outlet pressure at 125 psig or less, or to a point where hydraulic calculations prove that the system pressure will not exceed 125 psig under any circumstances.

B. Below ground piping 2” diameter and smaller to be listed/approved type K soft copper tubing in a single length with no in-line couplings or joints, and a minimum number of fittings (required by branch take-offs, if any) unless indicated otherwise. Fittings (if required) to be wrot copper with socket solder brazed connections. Completed installation to be rated for 175 psig working pressure. All piping 1” diameter size and smaller below slab on grade to be installed in a schedule 40 PVC 3” diameter conduit. Install conduit from 2" above slab at entry/exit points, and use long sweep elbows for vertical rise/drop from/to below slab. Unless indicated otherwise, horizontal piping and conduit below slab to run in a straight line direct from entry to exit points.

C. Solder, flux and all other pipe joining materials shall be certified "lead free" and listed for use with potable water service.

2.2 SHOCK ABSORBERS

A. Similar to Zurn Shocktrol series Z-1700, sized and installed as recommended by the manufacturer for specific conditions at each location.

B. Equal shock absorbers as manufactured by Zurn, Mifab, J.R. Smith, Josam, Sioux Chief or Precision Plumbing Products may be provided at the contractor's option.

2.3 HOSE BIBBS; as specified on plans, unless indicated otherwise.

A. Equal hose bibbs as manufactured by Zurn, Mifab, J.R. Smith, Josam, Wade, Watts, Woodford or Murdock may be furnished at the contractor's option.

2.4 TRAP PRIMER ASSEMBLIES; as specified on plans, unless indicated otherwise.

A. Equal trap primer assemblies as manufactured by Zurn, J.R. Smith, Josam, Precision Plumbing Products, Wade, Sloan, Mifab or Sioux Chief may be furnished at the contractor's option.

2.5 TEMPERING/MIXING VALVE ASSEMBLIES

A. Low flow capacity or individual fixture/equipment service shall be thermostatic mixer assembly similar to Leonard 210 series with inlet check/stops, bi-metal thermostat, bronze construction, screwdriver adjustable temperature setting, and ½" threaded connections rated for 125 psig working pressure.

B. High flow capacity or multiple simultaneous use fixtures/equipment service shall be thermostatic mixer assembly similar to Leonard TM series with inlet check/stops, bi-metal thermostat, bronze construction, lever adjustable temperature setting, and threaded connections rated for 125 psig working pressure.

C. Broad flow range (minimum/maximum) and/or multiple non-simultaneous use fixtures/equipment service shall be thermostatic mixer assembly similar to Lawler 86000 series with isolation/service valves, pressure gauges, thermometer, and inlet/outlet union connections rated for 125 psig working pressure. Furnish with lockable cabinet enclosure for surface mounting on wall when indicated on plans; furnish with painted pressure treated 1/2" thickness plywood backboard for exposed installation if no cabinet is indicated.

D. Assemblies shall be furnished with adjustable position inlets and outlet, incoming temperature range of 120 to 180 degrees F., and nominal pressure differential of 10 psig unless indicated otherwise. Flow capacities, outlet temperature setting and inlet/outlet temperature differential as indicated on plan. Provide assemblies as required to operate properly with temperature differential as indicated.

C. Tempering valves as specified herein may be used for supply to emergency/safety fixtures, provided they are listed by the manufacturer for such service. Tempering valves in this application shall include a cold water bypass feature.

D. Equal tempering/mixing valve assemblies as manufactured by Leonard, Watts, Bradley, Zurn, Powers, Lawler, T & S or Symmons may be furnished at the contractor's option.

2.6 PRESSURE REDUCING/REGULATING VALVES

A. Low flow (0.5 to 20 gpm) capacity and/or individual fixture/equipment service shall be direct acting diaphragm type bronze construction pressure reducing

valve similar to Watts model no. U5LP with integral inlet strainer, outlet pressure gauge, internal thermal expansion bypass, adjustable outlet pressure range and threaded connections rated for 175 psig working pressure. Valve to be rated for maximum 180 degrees F. temperature service. Assembly to be listed in accordance with ASSE 1003 standards.

B. Moderate flow range (1 gpm minimum/120 gpm maximum) diversified load service shall be direct acting diaphragm type bronze construction pressure reducing valve similar to Watts model no. 223 with adjustable outlet pressure range and threaded or flanged connections rated for 175 psig working pressure.

C. Broad flow range (1 gpm minimum/1800 gpm maximum) diversified load service shall be hydraulically operated pilot controlled diaphragm type iron body valve similar to Cla-Val Co. 90-48 series with bronze fittings, integral low flow by-pass, adjustable outlet pressure range and threaded or flanged connections rated for 175 psig working pressure.

D. Assemblies shall be furnished with adjustable position inlets and outlet. Flow capacities, outlet pressure setting and inlet/outlet pressure differential as indicated on plan. Provide assemblies as required to operate properly with pressure differential as indicated.

E. Assemblies shall be listed for potable water service including certified “lead-free” construction.

F. Equal pressure reducing/regulating valve assemblies as manufactured by Watts, Cla-Val Co., Wilkins, Febco, Ames, Anderson, Watrous or Conbraco may be furnished at the contractor's option.

2.7 BACKFLOW PREVENTORS

A. Reduced pressure principle backflow preventers shall be similar to Ames model no. LF4000B with ASSE 1013 listing, test cocks, pressure differential relief valve, positive seat check valves, fixed air gap drain/vent fitting & tight-closing shut-off valves before and after the device. Furnish with threaded connections for sizes 2” and smaller, 150 class flange connections for sizes 2-1/2” and larger.

B. Dual check backflow preventor assemblies shall be similar to Watts model no. 7 with ASSE 1024 listing, union connection body, bronze construction, two (2) plastic check modules, buna "N" seals, stainless steel springs and "O" ring check module and union seals. Furnish with threaded inlet and outlet connections.

C. Pressure type in-line vacuum breaker assemblies shall be similar to Watts model no. 800M4QT anti-siphon type with ASSE 1020 listing, bronze construction, isolation valves, test cocks, check assemblies, wall/panel escutcheons and maximum 140 degrees F. temperature rating.

D. Dual check backflow preventors with intermediate atmospheric vent assemblies shall be similar to Watts model no. SD2 with ASSE 1032 listing, bronze

construction, priimary and secondary check valves, stainless steel fittings and integral strainer. Furnish with threaded inlet, outlet and vent connections.

E. Dual check backflow preventors with intermediate atmospheric vent assemblies for beverage dispenser supply piping shall be similar to Watts model no. SD3-LS with ASSE 1022 listing, stainless steel construction, primary and secondary check valves. Furnish with threaded inlet, outlet and vent connections.

F. Double check backflow preventor assemblies shall be similar to Watts model no. 007 for sizes up to and including 2"; sizes larger than 2" to be similar to Watts no. 709. Complete assemblies are to be provided in compliance with ASSE standard 1015, including two (2) isolation/service shut-off valves (N.R.S. for domestic service; O.S.&Y. for fire protection), two (2) check valves, and test cocks. Provide with threaded connections for sizes 2 1/2" and smaller, flanged connections for sizes 3" and larger.

G. At all hose thread outlet connections to the domestic water supply system not furnished with an integral backflow prevention device, provide an vacuum breaker similar to Watts model no. NF8 permanently affixed, with ASSE 1011 ¾" hose thread connection at outlet.

H. Unless indicated otherwise, backflow prevention assemby size shall be as indicated by piping size where installed on plans.

I. All backflow prevention assemblies in finished/exposed locations to be furnished with polished chrome finish with wall/panel/ceiling piping escutcheons.

J. Backflow preventors to be rated for 125 psig working pressure.

K. Equal assemblies as manufactured by Watts, Zurn, Wilkins, Febco, Conbraco, Hersey, Ames, Clayton, Aero or Lawler may be furnished at the contractor's option.

2.8 SECONDARY WATER METER

A. Magnetic modular disc type meter with npt connections rated for 150 psig working pressure, two-piece bronze measuring chamber, integral strainer, hermetically sealed register with hinged cover, bronze construction with stainless steel trim and molded plastic measuring disc piston. Maximum temperature rating of 110 degrees F., and register with readout in U.S. gallons. Peak flow capacity at maximum 5 psig pressure drop, flow range as indicated on plans. Provide low voltage BAS output contacts for "pulse" water consumption indication; (1) pulse equals 10 gallons of water used.

B. Meter assemblies as manufactured by Badger, Elster, Hersey, Kent, Neptune, Equimeter, Master Meter or Sensus may be furnished at the contractor's option.

PART 3 EXECUTION

3.1 All piping that supplies a flush valve, solenoid valve (other than slow-closing type), foot pedal operator, spring return operator or other quick closing type device shall have a shock absorber installed in accordance with the manufacturer's recommendations. Unless indicated otherwise, where multiple fixtures or equipment in adjacent locations (such as within a chase or other enclosure) are supplied by common piping manifold, a properly sized and installed shock absorber may be utilized.

3.2 Branches to fixtures the following sizes unless otherwise indicated:

A. Water Closets, F.V. - 1 inch

B. Electric water coolers - 1/2 inch
C. Urinals, F.V. - 3/4 inch
D. Lavatories - 1/2 inch HW and CW
E. Sinks - 1/2 inch HW and CW
F. Mop Sink - 1/2 inch HW and CW
G. Service sink - 1/2 inch HW and CW
H. Hose Bibbs (exterior) - 3/4 inch
I. Hose Bibb (interior) - 1/2 inch

Unless otherwise shown on drawings, this Contractor shall be responsible for sizing domestic water piping in chases, etc. to individual fixtures. When piping serves flush valves, cold water pipe shall be run full size to end of pipe chase run and a listed shock absorber installed. When cold water pipe is 2" or above and serves flush valves, the pipe main in the chase can only be reduced to 1-1/2" size. 1/2" hot water pipe shall serve up to four (4) lavatories. Other pipe sizing criteria shall be as outlined in the current edition of "ASHRAE Fundamentals Handbook".

3.3 Run all water piping level and conceal wherever possible. Piping to be installed to allown complete drain down of system back to main riser(s) at base of system whenever possible. Provide ¾" drains at base of riser(s), and any other trapped or low points when such are unavoidable due to project conditions. ¾" Drains to consist of ball valve with outlet connection vacuum breaker as specified herein.

3.4 Install an in-line pressure type vacuum breaker as specified herein in the individual/dedicated supply piping for all valves, fittings, trim or other elements with serrated ends or other outlets capable of hose connection that do not include an integral listed/approved backflow prevention device.

3.5 Balance recirculating branch line flows as required for proper operation of systems. Provide combination balance/shut-off valves, check valve, thermometer and Pete's plugs for each branch recirculating line.

3.6 Horizontal supply piping below slabs on grade to be installed entirely below the slab structure, including conduit sleeve when provided. Underslab piping and/or conduit shall not be embedded in or support slab structures.

3.7 Coordinate installation with structure, site conditions and work of other trades at and adjacent to domestic water service piping installation.

3.8 Maintain necessary clearance from structural support elements as required for installation of domestic water service piping outside of support/bearing zones.

3.9 Piping shall be installed according to the pipe manufacturer's specifications & recommendations including preparation, joining methods, allowances for expansion/contraction, bedding, backfill, support & restraint.

END OF SECTION

SECTION 22 13 16

BUILDING SOIL, WASTE & VENT PIPING SYSTEM

PART 1 GENERAL

1.01 SCOPE

A. Furnish a complete system of interior soil waste drainage (includes sanitary and vent piping) from building fixtures, equipment, and any other elements requiring same.

PART 2 PRODUCTS

2.01 Soil (sanitary) waste and vent piping to be as follows:

A. Standard weight cast iron DWV pipe and fittings with neoprene gasket hub and spigot or no-hub mechanical coupling joints and connections. No-hub mechanical couplings to be installed above grade only.

B. Standard weight copper DWV pipe and fittings with socket solder joints and connections. For use above grade only.

C. Schedule 40 type 1, grade 1 solid core PVC DWV pipe and fittings with socket solvent solder joints and connections. Plastic piping not permitted for exposed installation in air plenums or for high temperature discharge in excess of 120 degrees F.

D. Pumped sanitary sewage ejector piping to be schedule 40 galvanized steel pipe and galvanized cast or malleable iron fittings with threaded joints and connections; or type L copper pipe and wrot copper fittings with socket solder fittings. Piping installation to be rated for 175 psig working pressure.

E. Piping connected to or individually associated with urinal fixtures that do not have integral traps shall not be copper or steel type materials.

2.02 Plastic piping in air plenum spaces to be provided with a listed UL 910 covering similar to 3M Fire Barrier Plenum Wrap 5A. Plenum wrap installation to be in compliance with the manufacturers' recommendations & the requirements of the Building Code & inspection authorities.

PART 3 EXECUTION

3.01 Furnish and install a cleanout at the base of each stack and elsewhere as required by the Plumbing Code.

3.02 All cast iron soil pipe shall be bitumastic coated inside and out. All cast iron piping (including joints and connections) shall be installed in accordance with standards as set forth by The Cast Iron Soil Pipe Institute (CISPI).

3.03 At the Contractor's option, hubless cast iron soil pipe may be joined by using heavy duty "Clamp All" couplings in lieu of "No-Hub" couplings. Couplings are to be made of 24

gauge type 304 stainless steel with hi-torque clamps and neoprene gaskets. Couplings shall be installed and tested in accordance with the manufacturer's recommendations.

3.04 Piping shall be installed according to the pipe manufacturer's specifications & recommendations including preparation, joining methods, allowances for expansion/contraction, bedding, backfill, support & restraint. Piping 6" size & larger suspended from overhead structure with the top of pipe more than 18" below shall have listed sway bracing provided at each 6" size & larger branch connection greater than 45 degrees, and at each change of direction greater than 45 degrees. In addition all piping 6" size & larger shall have rod & clamp restraints provided for couplings at each branch connection, change of direction (horizontal & vertical) and changes in diameter greater than (2) standard pipe sizes. A tee-wye fitting and/or a wye fitting with a direct attached 1/8 bend elbow is considered a branch connection greater than 45 degrees. Provide listed expansion joint fittings in all plastic piping stack mains extending through two or more floor levels in accordance with the piping manufacturer's recommendations.

3.05 Roof flashings furnished and set loose in place by the Plumbing Contractor, for final weather-tight installation and integration with roofing elements by roofing installation contractor. Flashings shall be compatible with roofing elements as confirmed with the roofing contractor in advance. Coordinate with roofing contractor for proper installation.

3.06 Coordinate installation with structure, site conditions and work of other trades at and adjacent to soil, waste and vent service piping installation.

3.07 Maintain necessary clearance from structural support elements as required for installation of soil, waste and vent service piping outside of support/bearing zones.

3.08 Vents through roof to atmosphere shall comply with the following installation criteria:

A. Maintain minimum 10 feet horizontal from all air intakes, including doors and operable windows; unless the vent termination is extended 24" or more above the top of all intakes.

B. Extend vent terminals to a minimum of 12" above the roof deck.

C. Where the roof is accessible to building occupants or maintenance personnel, extend vent terminals to a minimum 7 feet above the roof deck.

D. Maintain minimum 10 feet horizontal clear from roof perimeter.

E. When possible, install vents through roof on the downstream side of building air intakes, relative to the prevailing wind direction.

END OF SECTION

SECTION 22 42 00

PLUMBING FIXTURES

PART 1 GENERAL

1.1 SCOPE

A. Furnish and install all plumbing fixtures and associated accessories as specified herein at locations indicated on plans. Fixtures to be provided free of defects and set in a neat, finished and uniform manner.

B. Where fixtures are indicated to be handicap accessible, install as directed herein and in compliance with the codes and guidelines referenced.

C. All plumbing fixtures, fittings and equipment to be "Water Sense" labeled when available.

D. Any devieation from fixtures specified on drawing must be approved in writing by Architect, Engineer and Owner in advance.

PART 2 PRODUCTS

2.1 Plumbing fixtures, trim, fittings, accessories, appurtenances, etc. not included herein are as specified on plans.

2.2 Viterous China plumbing fixtures and accessories as manufactured by American Standard, Kohler, Zurn or Toto or Company may be furnished at the Contractor's option.

2.3 Stainless steel sinks and accessories as manufactured by Elkay, Just, Carlton or Advance Tabco may be furnished at the Contractor's option.

2.4 FAUCETS

A. Sensor operation faucets and accessories as manufactured by Sloan, Bradley, Delaney, Symmons or any of the manufacturers listed for manual operation faucets may be furnished at the Contractor's option. Sensor operated faucets manufactured by Zurn are prohibited.

B. Where solid cast metal body faucets with integral waterways are specified, alternate stamped metal hollow body faucets with tubing waterways shall not be accepted.

2.5 Flush valves and accessories as manufactured by Sloan, Geberit or Delany may be furnished at the Contractor's option. Flush Valve(s) manufactured by Zurn are prohibited.

2.6 Seats for water closets as manufactured by Bemis, Church, Olsonite, Beneke or Centoco may be furnished at the Contractor's option. All seats are to be furnished with self-sustaining check hinges.

2.7 Fixture carriers specified as manufactured by Josam, Zurn, Mifab, J. R. Smith, Watts or Wade may be furnished at the Contractor's option.

2.8 Equivalent precast molded stone or terrazzo mop sink receptors as manufactured by Fiat, Williams, Creative Industries, Mustee or Cutler may be furnished at the Contractor's option.

2.9 Equivalent disposers/garbage grinders as manufactured by I.S.E., Waste King, Bus Boy or Hobart may be furnished at the contractor's option.

2.10 Unless indicated otherwise, all exposed metallic parts, piping, trim, fittings, accessories, appurtenances, etc. associated with plumbing fixtures shall be polished chrome finished when available.

2.11 Provide polished chrome plated brass friction-fit escutcheons for all supply & drain piping penetrations of structure or casework at each plumbing fixture setting, and at any exposed plumbing fixture piping connections.

2.12 At all handicap access lavatories and/or sinks with exposed supply and drain piping below, provide pre-fabricated closed cell vinyl insulation/cover assemblies with seamless PVC jacket for all supply (full range of hot, cold and tempered) and drain piping. Assembly to be similar to McGuire Pro-Wrap series. Offset drains (if used) to be provided with cover assemblies specifically designed for same. Assemblies to be listed by manufacturer as handicap access compliant.

PART 3 EXECUTION

3.1 Provide individual accessible stop valves on all fixture and equipment supply piping.

3.2 Furnish fixture carriers where specified to suit wall construction as indicated on Architectural Drawings. Carriers to be anchored securely to floor.

3.3 Install all fixtures according to manufacturer's recommendations.

3.4 Mounting heights of fixtures and associated equipment as indicated on drawings.

3.5 Install vandal resistant .5 gpm flow restrictors on all lavatory faucets in public access toilet rooms.

3.6 All exposed portions of supply and drain piping, including fittings, accessories and appurtenances, below handicap access lavatories and sinks (with the exception of wall escutcheons) to be provided with cover by completed installation specified herein, in accordance with handicap accessibility requirements.

3.7 At all countertop or other casework conditions, verify exact location and installation of all items with Architectural documentation before any work is performed. Coordinate installation with the General Contractor. Where plumbing fixtures are installed in casework and indicated to be "Handicap Accessible", coordinate installation with General Contractor to provide clearances and mounting heights as required.

3.8 Coordinate with the General Contractor where shower enclosures are furnished by the Plumbing Contractor with grab bars, seats, etc., to provide the required structural support for all items per the manufacturer's recommendations.

3.9 At handicap access water closet enclosures, verify "wide side" of enclosure from Architectural Drawings and provide flush valve assemblies with handle in corresponding location to comply with A.D.A. requirements.

3.10 All handicap access fixture controls, including faucets and flush valves, to be provided with operators requiring 5 lb. pressure or less for operation.

3.11 Where accessories such as grab bars, seats, etc., are provided by the General Contractor at plumbing fixture or equipment locations (i.e. shower and toilet stalls), coordinate installation of plumbing equipment to avoid conflicts, and allow proper operation of and accessibility to all items. Verify location of all items provided by the General Contractor from Architectural documentation in advance of plumbing work being performed.

3.12 120V electric input to junction box at each individual and/or "bank" of common type fixtures provided with sensor operated flush valves/faucets (water closets, urinals, lavatories, etc.) to be provided by the Electrical Contractor. 24V wiring from transformer at junction box to individual flush valve/faucet control solenoid is the responsibility of the Plumbing Contractor. A "bank" of fixtures is to consist of a group of adjacent items of the same type, in the same room (i.e.; one group of water closets in men's toilet room; one group of water closets in women's toilet room; etc.). Fixtures in separate rooms are not to be in a common 24V transformer wiring circuit. Maximum of ten (10) water closets or urinals per bank; maximum of three (3) lavatories per bank. Coordinate installation with the Electrical Contractor. All 24V wiring to be in conduit.

3.13 Sensor flush valve/faucet transformers and interconnecting fixture wiring and accessories to be located in secure, restricted access areas/locations (i.e.; an accessible chase, casework superstructure, etc.). Coordinate installation with General Contractor.

3.14 Unless indicated otherwise, when undercounter type dishwashers are installed adjacent to sinks specified herein, provide ½" hot water supply to dishwasher from sink supply upstream of fixture stop, and furnish P-trap with 1" drain connection fitting on fixture side of trap for dishwasher connection. Dishwasher supply piping to include in-line stop, dual check backflow preventor (similar to Watts no. 7) and shock absorber. Dishwasher piping to be below counter in casework, in a concealed, accessible location. The backflow preventor in the supply piping may be deleted if an approved backflow prevention device is confirmed to be provided as an integral component of the dishwasher assembly.

3.15 Joints formed where fixtures come into contact with walls or floors shall be sealed water-tight with an approved sealing compound. Coordinate installation with the General Contractor.

END OF SECTION

SECTION 22 95 00

PLUMBING ALTERNATES

PART 1 GENERAL

1.01 REFERENCE

A. Section 22 05 50 - DEMOLITION
B. Section 22 11 16 - DOMESTIC WATER PIPING SYSTEM
C. Section 22 13 16 - BUILDING SOIL, WASTE AND VENT PIPING SYSTEM
D. Section 22 42 00 - PLUMBING FIXTURES

1.02 SCOPE

A. ALTERNATE #6: REPLACING EXISTING SINK IN KITCHEN #122

1. Bidders shall state the amount to be added to the base bid to replace existing sink bowl and faucet with new sink bowl and faucet in kitchen room #122. See plumbing plans for continuation.

B. ALTERNATE #7: REPLACING (2) EXISTING SINKS IN ROOM #133

1. Bidders shall state the amount to be added to the base bid to replace (2) existing sink bowl and faucet with new sink bowl and faucet in room #133. See plumbing plans for continuation.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.1 Any modifications of changes of any description from the drawings or specifications, made necessary by the alternate, including work involving other trades, shall be the responsibility of this Contractor and the cost there of shall be included in their bid on the Alternate.

End of Section

SECTION 23 01 00

HEATING, VENTILATING AND AIR CONDITIONING

PART 1 GENERAL

1.01 Sections 23 00 00 thru 25 00 00 (as included), cover Heating, Ventilating and Air Conditioning Work Specifically.

1.02 REFERENCE

A. Refer to Sections 23 00 00 thru 23 05 99 (as included), for items of a general nature which apply to this portion of work.

1.03 SCOPE

A. The Contractor shall furnish all labor, materials, tools, incidentals and details necessary to provide a complete heating, ventilating and air conditioning system, ready to operate, including but not limited to, the items listed under the Heating, Ventilating and Air Conditioning Specification Index.

B. Include any minor details essential to successful operation, and any other items specified or shown on the Drawings.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

Not Applicable

END OF SECTION

SECTION 23 01 05

HVAC GENERAL PROVISIONS

PART 1 GENERAL

1.01 REFERENCE

A. The Instructions to Bidders, General Conditions and Division 1 - General Requirements as set forth in the foregoing pages are hereby incorporated into and become a part of the Specifications for the work under this title, insofar as they apply hereto.

B. The General Requirements described in this section are intended to be supplemental to those included in the Division 1 & 2 General Conditions.

1.02 GENERAL REQUIREMENTS

A. Furnish all labor, materials, tools, incidentals and details necessary to provide a complete mechanical system, ready to operate, including but not limited to the items listed under the Mechanical Specification Indexes.

B. Include any minor details essential to successful operation and any other items specified or shown on the Drawings.

C. The Contractor is required to read the Specifications covering all branches of the work and will be held responsible for coordination of his work with work performed under all other Contracts.

D. The Contractor is required to visit the site and fully inform himself concerning all conditions affecting the scope of his work. Failure to visit the site shall not relieve the Contractor from any responsibility in the performance of his Contract.

E. The Contractor should feel free to contact the Construction Manager immediately if there is any question regarding the meaning or intent of either Plans or Specifications, or if he notices any discrepancies or omissions in either Plans or Specifications.

F. Other than minor adjustments shall be submitted to the Engineer for approval before proceeding with the work.

G. Scheduling of all work performed by this Contractor shall be completely coordinated with the Construction Manager.

H. This Contractor shall furnish to the Construction Manager a written description of procedure on this job including scheduling of the work to be done for his approval. This shall be submitted within 10 days after the Contract is awarded. There shall be six (6) copies.

I. All material hoisting by trade involved.

J. Arrangements for storage of tools and material, removal of debris, and interruptions of services shall be made with Construction Manager.

K. All connections to, or revisions in, existing piping or facilities shall be done at such time as agreed to by the Construction Manager and all work shall be scheduled as required under "General Conditions". Revisions to the existing piping systems must be done with the minimum of shutdown time. All piping shall be run to the point of new connections and new equipment installed and ready to operate before any connections are to be made.

L. Extreme care shall be taken to avoid interference with Owner's equipment, especially in the existing portion of the building. Consult with the Engineer regarding any points where interference is likely to occur and follow dimensions carefully where given on the Drawings. Pay particular attention to minimum clear heights when indicated on the Drawings.

M. It is mandatory that dust and debris be held to a minimum. This Contractor shall provide drop cloths, screens, curtains, etc., to protect Owner equipment and personnel from dust and dirt during the course of his work. All damage to existing construction or finishes shall be repaired by this Contractor upon removal of dirt and dust protection devices. All dirt, dust and other protection devices shall be approved by Owner before any work is started in the area involved.

N. The Contractor, insofar as this Contract is concerned, shall at all times keep the premises and the building in a neat and orderly condition.

O. At the completion of the project, this Contractor shall promptly clean up and remove from the site, all debris and excess materials.

1.03 DRAWINGS

A. Consult all Contract Drawings which may affect the locations of any equipment, apparatus, piping and ductwork and make minor adjustments in location to secure coordination.

B. Piping and duct layout is schematic and exact locations shall be determined by structural and other conditions and verified in the field. This shall not be construed to mean that the design of the system may be changed, it refers only to the exact location of piping and ductwork to fit into the building as constructed, and to coordination of all work with piping and equipment included under other Divisions of the Specifications.

C. The layout shown on the Drawings is based on a particular make of equipment. If another make of equipment is used which requires modifications or changes of any description from the Drawings or Specifications, this Contractor shall be

responsible for making all such modifications and changes, including those involving other trades, as a part of this Contract and the cost thereof shall be included in his Bid. In such case, the Contractor shall submit Drawings and Specifications showing all such modifications and changes prior to starting work, which shall be subject to the approval of the Engineer.

D. The Engineer/Construction Manager reserves the right to make minor changes in the location of piping and equipment up to the time of rough-in without additional cost to the Owner.

E. Where certain grades and/or elevations are given on the Drawings, they have been obtained from the best information available; however, they are not guaranteed. This Contractor MUST assume the full responsibility of verifying present elevations in the field and making any adjustments as may be necessary, all of which must be included in his Bid Price.

F. Due to the scale of the Drawings, it is impossible to show all offsets and transitions which may be required. This Contractor shall carefully investigate the conditions affecting all work and shall furnish all elbows, fittings, transitions, etc., required to accomplish the desired result at no additional cost to the Owner.

G. Install all work as close as possible to walls, structural, members, etc., consistent with the proper space for covering, access, etc., so as to occupy the minimum of space and allow as much space as possible between ductwork, piping, etc. and the ceiling.

H. Actual dimensions shown on the Drawings and field dimensions shall take precedence over scaled dimensions.

1.04 PERMITS, INSPECTIONS AND CODES

A. The Construction Manager will obtain the general building permit. Any other permits required for the project will be obtained by the Contractor performing the work. Fees will be included in the bid price.

B. Submit Qualification Certificate for each welder to the Construction Manager before such welder starts work.

C. Completed installations shall conform with all applicable Federal, State and Local Laws, Codes and Ordinances, including but not limited to the latest editions of the following:

1. Ohio Building Code, Department of Industrial Relations, State of Ohio.

2. Specific Safety Requirements Relating to Building and Construction Work, Industrial Commission and Department of Industrial Relations, State of Ohio.

3. Specific Safety Requirements Covering the Installation of Pressure Piping Systems, Industrial Commission and Department of Industrial Relations, State of Ohio.

4. Ohio Pressure Piping Systems Rules, Ohio Board of Building Standards and Department of Industrial Relations, State of Ohio.

5. A.S.M.E. Pressure Piping Code - Section B31.1

6. Specific Safety Requirements Covering the Installation of Mechanical Refrigeration Systems and Equipment, Industrial Commission and Department of Industrial Relations, State of Ohio.

7. Section IX, Standard for Welding Requirements Covering the Ohio Boiler Inspection Laws and Rules, and Rules for the Construction of Unfired Pressure Vessels, Industrial Commission and Department of Industrial Relations, State of Ohio.

8. Rules and Regulations for Fuel Burning Equipment and Equipment Pertaining Thereto, The Office of Pollution Control, Ohio Environmental Protection Agency.

9. National Electrical Code, Bulletin No. 70, National Fire Protection Association.

10. Air Conditioning and Ventilating, Bulletin No. 90 A, National Fire Protection Association.

11. Life Safety Code, Bulletin No. 101, National Fire Protection Association.

12. All Work Under Jurisdiction of Local Fire Marshal shall conform to requirements set forth by Fire Marshal's Office and National Fire Protection Association.

D. Nothing contained in the Plans and Specifications shall be construed to conflict with these laws, codes and ordinances and they are hereby made a part of these Specifications.

E. When the work is completed, the Contractor shall furnish the Owner a Certificate of Inspection and Approval from the State of Ohio Board of Health before final payment of the Contract will be allowed.

1.05 OHIO ENERGY CODE

A. The Mechanical System must comply with all requirements of the State of Ohio "Code for Energy Conservation". This includes, but is not limited to, efficiencies, power factors, insulation thickness, etc.

B. All motors 1 HP or more shall be “energy efficient” motors meeting all requirements of ASHRAE Standard 90.1 - 2004.

1.06 UTILITIES

A. The Contractor shall investigate and locate all utilities prior to construction.

B. Each Contractor is responsible for rerouting or replacing existing utilities where necessary to permit installation of his work.

C. The identity and location of the existing underground utility facilities known to be located in the construction area have been shown on the plans as accurately as previous Engineering documents. The Architect and Engineer assume no responsibility as to the accuracy or the depths of the underground facilities shown on the plans.

D. Support, protection and restoration of all existing utilities and appurtenances shall be the responsibility of the Contractor. The cost of this work shall be included in the price bid for the various items.

E. The Contractor shall alert immediately the occupants of nearby premises as to any emergency that he may create or discover on or near such premises of the underground facility, any break or leak on its lines or any dent, gouge, groove or other damage.

1.07 OPERATING AND MAINTENANCE INSTRUCTIONS

A. This Contractor shall thoroughly instruct and supervise the Owner’s Maintenance Personnel in the proper operation and maintenance of the mechanical system equipment. This Contractor shall be responsible for arranging for the instruction and supervision at a time convenient to the Owner or their representative and for notifying the Engineer of the time at least 48 hours in advance.

Instructions shall include the following:

1. Location of equipment and explanation of what it does.

2. Reference to "Operating Instruction Manuals" for record and clarity.

3. Coordination of written and verbal instruction so that each is understood by all personnel.

4. Explanation of Temperature Control System including panels.

5. Specific maintenance to be performed by Owner.

B. Furnish one (1) copy of the printed Operating and Maintenance Instructions for the Mechanical Systems for review. Copy shall be neat, legible and bound in a hardback 3-ring notebook. After final approval, provide four (4) copies of Operation and Maintenance Instructions for submittal to Construction Manager. Instructions shall consist of the following items:

1. Title Page: Title of Project, address, date of submittal, name and address of Contractor, name of Construction Manager, name of Engineer, name of Owner.

2. Second Page: Index of Manual Contents.

3. First Section: A copy of each approved shop drawing and submittal with an index at the beginning of the section.

4. Second Section: A list of all equipment used on the project, together with supplier's name and address.

5. Manufacturer's maintenance manuals for each item of equipment furnished under this contract. Manuals shall include such items as parts list, detailed lubrication instructions, procedures for performing normal maintenance functions, preliminary trouble shooting procedures and wiring diagrams.

6. Complete wiring diagrams for the mechanical systems as actually wired including control and interlock wiring.

7. Brief but complete instructions for start-up, shut- down and routine maintenance of each system.

8. Routine and 24-hour emergency information:

a. Name, address and telephone number of servicing agency.

b. Include names of personnel to be contacted for service arrangements.

C. Frame one (1) copy of brief start-up, shut-down and routine maintenance instructions and complete system wiring diagrams under glass and mount on the Equipment Room wall. Temperature Control schematics may be laminated with plastic at the Contractor's option.

1.08 AS-BUILT DRAWINGS

A. The Contractor shall keep an accurate record of all deviations from Contract Drawings and Specifications. He shall neatly and correctly enter in colored pencil

any deviations on Drawings affected and shall keep the Drawings available for inspection. Extra sets of Drawings will be furnished for this purpose.

B. At the completion of project and before final approval, make any final corrections to Drawings and certify to the accuracy of each print by signature and deliver same to Construction Manager.

C. Contractor to provide electronic as-builts at the end of the project.

1.09 SUPERVISION

A. This Contractor shall have in charge of the work, on the job during construction, a competent superintendent experienced in the work installed under this Contract.

1.10 UNACCEPTABLE WORK AND OBSERVATION REPORTS

A. Work shall be unacceptable when found to be defective or contrary to the Plans, Specifications, Codes specified or accepted standards of good workmanship.

B. The Contractor shall promptly correct all work found unacceptable by the Owner or Engineer whether observed before or after substantial completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such unacceptable work, including compensation for the Engineer's or Construction Manager’s additional services made necessary thereby.

C. During the course of construction, the Engineer will prepare "Observation Reports" with a list of items found to be in need of correction. All items listed shall be corrected by the Contractor. A space is provided on the form for the Contractor to note the completion of each item. All prior "Observation Report" items must be completed, the lists signed and returned to the Engineer prior to making the final inspection. After the final list is issued, the same procedure will apply.

1.11 FINAL INSPECTION

A. When the Contractor determines all work is completed and working properly per the Contract Documents, he shall request a "final" inspection by the Engineer in writing. If more than one reinspection is required after this final inspection, the Contractor shall bear all additional costs including compensation for the Engineer additional services made necessary thereby. A final inspection will not be made until Operating and Maintenance Manuals and Air Balance Reports are submitted and approved and all prior "Observation Report" punch lists completed, signed and returned to the Engineer.

B. As part of the final checkout of the project, the Engineer will be checking the operation of the various systems. This Contractor shall provide such assistance as required (including manpower and tools) to start and stop the various systems, open and close valves etc. and simulate summer, winter and other

temperature control sequences. The Contractor (not the Engineer) is responsible to turn on the systems and demonstrate they are operating properly.

1.12 GUARANTEE

A. This Contractor is responsible for all defects, repairs and replacements in materials and workmanship, for a period of one (1) year after final payment is approved by the Owner.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 23 01 10

MANUFACTURER'S DRAWINGS

PART 1 GENERAL

1.01 SCOPE

A. The Contractor shall submit to the Construction Manager for review, within three weeks after date of contract, electronic copies of manufacturer's drawings, wiring diagrams, pump and fan curves or data. The Engineer will review Contractor's shop drawings and related submittals (as indicated below) with respect to the ability of the detailed work, when complete, to be a properly functioning integral element of the overall system designed by the Engineer. Before submitting a shop drawing or any related material to the Engineer, Contractor shall: review each such submission for conformance with the means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto, all of which are the sole responsibility of Contractor; approve each such submission before submitting it; and so stamp each such submission before submitting it. The Engineer shall assume that no shop drawing or related submittal comprises a variation unless Contractor advises Engineer otherwise via a written instrument, which is acknowledged by Engineer in writing. The shop drawings and related material (if any) called for are indicated below:

Heating, Ventilating and Air Conditioning Contract

Exhaust Fans
Vibration Isolators
HVAC Insulation
Dampers
Registers, Grilles, and Diffusers
Temperature Controls

B. The Engineer shall return shop drawings and related materials with comments provided that each submission has been called for and is stamped by Contractor as indicated above. The Engineer shall return without comment material not called for or which has not been approved by Contractor.

C. This Contractor shall furnish equipment shop drawings which will indicate power hook up and control connections as required for mechanical equipment. "Stock" wiring diagrams are NOT ACCEPTABLE.

D. The manufacturer shall provide a statement on submittals that equipment furnished complies with the Ohio Energy Code. This previously relates to high efficiency motors, EER's, COP's, etc.

E. Engineer's review of manufacturer's drawings or schedules shall not relieve the Contractor from compliance with the requirements of the plans and specifications.

1.02 QUANTITIES

A. Items may be referred to in singular or plural on Plans and Specifications. Contractor is responsible for determining quantity of each item.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

Not Applicable

END OF SECTION

SECTION 23 05 13

ELECTRICAL WORK

PART 1 GENERAL

1.01 REFERENCE

A. Section 23 01 05 - Paragraph 1.05 - OHIO ENERGY CODE
B. Section 25 00 00 – TEMPERATURE CONTROLS
C. Division 26 – ELECTRICAL

1.02 SCOPE

A. The HVAC Contractor shall furnish all motors for his equipment. Motor starters, safety switches and wired junction boxes shall be furnished and installed by the Electrical Contractor except where specifically specified to be furnished with certain mechanical equipment.

1.03 WORK INCLUDED - HVAC Contractor:

A. All control wiring unless otherwise specified. Temperature Control wiring by Temperature Control subcontractor except as noted below by Electrical Contractor.

B. 120 volt wiring required for mechanical equipment when not shown or specified elsewhere.

1.04 WORK INCLUDED - Electrical Contractor.

A. All power wiring.

B. All conduit and wiring incidental to Temperature Controls, including switches, controls, transformers and relays shall be by the HVAC Contractor, except wiring as indicated on the Electrical Drawings will be by the Electrical Contractor.

C. Motor starters, contactors, and disconnects where noted under "PRODUCTS" below.

D. Electrical Contractor shall provide 120 volt control power to a wired junction box near the Temperature Control Cabinets. Final connections to be made by the HVAC contractor.

1.05 SHOP DRAWINGS:

A. The Contractor shall furnish to the Electrical Contractor, equipment shop drawings which will indicate power hook-up and control connections as required for mechanical equipment. "Stock" Wiring Diagrams are Not Acceptable.

B. Prepare, as a part of Temperature Control shop drawings, complete terminal-to-terminal wiring diagrams. These will show terminal designations on control items and equipment. Wiring diagrams to be compatible with Electrical Drawings.

PART 2 PRODUCTS

2.01 Refer to Section 23 01 05 - Paragraph 1.05 for "Energy Code" requirements (Particularly power factor correction)

2.02 Refer to Division 26 - ELECTRICAL.

2.03 All motors 1/2 HP and larger shall be three phase; all motors, 1/3 HP and smaller shall be single phase unless specified otherwise.

2.04 All motors used in variable speed applications shall be high efficiency type and shall be rated for use with variable frequency drives.

2.05 All single-phase motors provided by this Contractor to have built-in thermal overload protection.

2.06 All motors furnished shall have copper windings and all motors five (5) horsepower and greater shall have factory installed lifting eyebolts. All motors shall conform to ANSI and NEMA standards.

2.07 Motor starters, contactors, and disconnects are provided and installed by the Electrical Contractor, unless part of packaged equipment furnished by this Contractor, or otherwise specified.

PART 3 EXECUTION

3.01 All wiring, conduits, etc., shall be in strict accordance with the requirements of the latest edition of the National Electrical Code and Division 26, Electrical specification.

3.02 All wiring, including low voltage wiring, shall be run in conduit.

3.03 Low voltage wiring may be size and type recommended by the Manufacturer and/or Temperature Control Contractor.

END OF SECTION

SECTION 23 05 17

FIRESTOPPING

PART 1 – GENERAL

1.01 SCOPE

A. Each Contractor shall be responsible for firestopping around all openings for pipes, ducts, conduits, etc., installed by him at all fire walls and smoke walls. Firestopping shall be performed by an installer who has been trained by manufacturer, or manufacturer's representative, in the installation procedures based on published UL tested fire stop systems.

1.02 DEFINITIONS

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.

1.03 GENERAL REQUIREMENTS

A. Test Requirements: ASTM E-814, "Standard Method of Fire Tests of Through Penetration Fire Stops" (July 1997).

B. Underwriters Laboratories (UL) of Northbrook, IL runs ASTM E-814 under their designation of UL 1479 and publishes the results in their "FIRE RESISTANCE DIRECTORY" that is updated annually.

1. UL Fire Resistance Directory:

a. Through-Penetration Firestop Devices (XHCR)
b. Fire Resistance Ratings (BXUV)
c. Through-Penetration Firestop Systems (XHEZ)
d. Fill, Voids, or Cavity Material (XHHW)
e. Forming Materials (XHKU)

C. International Firestop Council Guidelines for Evaluating Firestop Systems Associateing Judgments

D. ASTM E-84, Standard Test Method for Surface Burning Characteristics of Building Materials.

E. The Ohio Building Code (OBC)

F. NFPA 101 - Life Safety Code

1.04 QUALITY ASSURANCE

A. Firestop System installation must meet requirements of ASTM E-814 or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated.

B. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

C. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

D. For those firestop applications that exist for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgment drawings must follow requirements set forth by the International Firestop Council (September 7, 1994).

1.05 SUBMITTALS

A. Submit Product Data: Manufacturer’s specifications and technical data for each material including the composition and limitations, documentation of UL firestop systems to be used and manufacturer's installation instructions.

B. Manufacturer's Engineering judgment identification number and drawing details when no UL system is available for an application. Engineer judgment must include both project name and contractor’s name who will install firestop system as described in drawing.

C. Submit material safety data sheets provided with product delivered to job-site.

1.06 INSTALLER QUALIFICATIONS

A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer’s products per specified requirements. A manufacturer’s willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

1.08 PROJECT CONDITIONS

A. Do not use materials that contain flammable solvents.

B. Scheduling

1. Schedule installation of CAST IN PLACE firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.

2. Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 – PRODUCTS

2.01 FIRESTOPPING, GENERAL

A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

B. Provide components for each firestopping system that is needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

2.02 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with through penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:

1. Hilti, Inc., Tulsa, Oklahoma, (800)879-8000
2. Tremco Sealants & Coatings, Beachwood, Ohio, (216) 292-5000
3. 3M Fire Protection Products, St. Paul, Minnesota, (612) 736-0203

2.03 MATERIALS

A. Use only firestop products that have been UL 1479, ASTM E-814 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Cast-in place firestop devices are installed prior to concrete placement for use with non-combustible and combustible plastic pipe (closed and open piping systems) penetrating concrete floors, the following products are acceptable:

1. Hilti CP 680 Cast-In Place Firestop Device
2. Fox Coupling, Inc. "Cast-In-Place Firestop Coupling".
3. Proset Cast-In-Place Device

C. Sealant or caulking materials for use with non-combustible items including steel pipe & copper pipe, the following products are acceptable:

1. Hilti FS-ONE Intumescent Firestop Sealant
2. 3M Fire Barrier CP25 or Firestop Sealant 2000
3. Tremco Fyre Shield

D. Sealant or caulking materials for use with sheet metal ducts, the following products are acceptable:

1. Hilti CP 601S Elastomeric Firestop Sealant or CP 606 Flexible Firestop Sealant
2. Tremco Fyre-Shield High Performance Ceramic Firestop Sealant
3. 3M Fire Barrier CP25WB+ or 2000 Silicone Sealant

E. Intumescent sealant or caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe and plastic pipe, the following products are acceptable:

1. Hilti FS-ONE Intumescent Firestop Sealant
2. 3M Fire Barrier CP25WB+
3. Tremco Intumescent Acrylic or TremStop WBM

F. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:

1. Hilti CP 642 and CP643 Firestop Collar, CP645 Wrap Strip
2. Tremco TREMstop D Combustible Pipe Intumescent Device System and TremStop WS Wrap Strip
3. 3M Ultra Plastic Pipe Device and Fire Barrier FS-195+ Wrap Strip

G. Materials used for large size/complex penetrations made to accommodate multiple steel and copper pipes, the following products are acceptable:

1. Hilti FS 635 Trowelable Firestop Compound and FS 657 FIRE BLOCK
2. Tremco TremStop M Fire Rated Mortar and PS Pillows
3. 3M Fire Barrier CS-195+ Composite Sheet

H. Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate multiple steel and copper pipes, the following products are acceptable:

1. Hilti FS 657 FIRE BLOCK
2. Tremco PS Firestop Pillows
3. 3M CS Intumescent Sheet

I. Provide a firestop system with an "F" Rating as determined by UL 1479 or ASTM E814. The F rating must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated.

PART 3 – EXECUTION

3.01 PREPARATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify penetrations are properly sized and in suitable condition for application of materials.

2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

5. Do not proceed until unsatisfactory conditions have been corrected.

3.02 COORDINATION

A. Coordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for the work. Ensure device is installed before placement of concrete.

B. Responsible trade to provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

3.03 INSTALLATION

A. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration joint materials.

1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

2. Consult with mechanical Associate and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.

3. Protect materials from damage on surfaces subjected to traffic.

3.04 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas. All penetrations are to be labeled in accordance with the Owner’s standard labeling system. The HVAC Contractor shall coordinate all fire stopping requirements with the Owner prior to start of work.

B. Keep areas of work accessible until inspection and approval have been completed.

C. All fire stopping shall be inspected and approved by a licensed independent Consultant. All unapproved fire stopping products installed by this contractor will be removed and replaced at his expense.

D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

3.05 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

END OF SECTION

SECTION 23 05 21

CUTTING AND PATCHING

PART 1 GENERAL

Not Applicable

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.01 Avoid cutting of concrete, masonry and other new work by the use of inserts and sleeves.

3.02 Cutting for openings, when necessary, shall be done by this Contractor with such tools and methods as to prevent unnecessary damage to surrounding areas or equipment.

3.03 This Contractor shall give the Construction Manager locations and sizes of all openings required for the installation of mechanical equipment (other than piping openings), before walls, etc., are started. If it becomes necessary to cut into new work because of the failure of this Contractor to notify the Construction Manager, then the Construction Manager shall do any necessary cutting and patching at this Contractor's expense.

3.04 Patching shall match existing surfaces in kind and finish, and shall be done by the General Contractor at this Contractor's expense.

3.05 No structural member will be cut into without the expressed permission of the Structural Engineer.

END OF SECTION

SECTION 23 05 22

FOUNDATIONS AND SUPPORTS

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install welded steel frames and supports for all equipment requiring same. Furnish and install auxiliary steel as required for supporting pipes.

B. Pads for HVAC equipment shall be provided by the HVAC Contractor. Refer to HVAC Drawing for locations. Exact sizes as determined by the HVAC Contractor.

PART 2 PRODUCTS

2.01 All steel for frames and supports shall be standard weight black steel pipe or standard structural steel shapes.

2.02 All exterior frames and supports shall be galvanized.

2.03 Concrete for pads shall be a minimum of 6 bag mix per cubic yard with maximum slump of 4" and shall be air entrained 5 to 7% by volume. All concrete shall be a minimum of 6 bag mix per cubic yard. Pads shall have chamfered edges.

PART 3 EXECUTION

3.01 Grind all sharp corners and projections on supporting steel after fabrication. All steel shall have one (1) coat of metal primer after fabrication. All steel supports exposed to the weather shall be finished with a heavy coat of bitumastic.

END OF SECTION

SECTION 23 05 49

EXPANSION AND VIBRATION

PART 1 GENERAL

1.01 REFERENCE

A. Section 23 75 00 – SINGLE ZONE ROOFTOP UNITS

1.02 SCOPE

A. Materials furnished under Division 23 to be installed with all necessary expansion compensation, otherwise build in means of expansion compensation during construction.

B. Motorized or vibrating equipment must be isolated from supports or connections to prevent transmission of vibration or generation of sound.

C. Furnish and install a complete vibration isolation system to isolate all mechanical equipment and all piping and appurtenances attached thereto, from the Building structure. All mechanical equipment, including all fans and all other equipment as scheduled on the Drawings, shall be mounted on or suspended with vibration isolators.

D. All piping connected to reciprocating or rotating equipment shall be isolated with flexible connectors within five (5) feet of the equipment.

PART 2 PRODUCTS

2.01 All vibration isolator mounts, hangers and bases are based on those manufactured by Kinetics Noise Control, Inc.

2.02 "F" Mounts - Precompressed molded "Fiberglass" isolation pads, neoprene jacketed and stabilized during manufacture. Pads shall be sized for loading from 40 to 60 psi and shall have a static deflection as tabulated on the Drawings. Isolation pads shall be type KIP-Q.

2.03 "S" Mounts - Free standing, unhoused stable "Spring" mounts, incorporating leveling bolts, and a means of bolting to the supporting unit. Minimum static deflection shall be as tabulated on the Drawings. Mounts shall have 1/4" neoprene jacketed fiberglass noise isolation pads bonded to the bottom of the spring mounts. To assure stability, the minimum outside spring diameter shall be as tabulated below, and the springs shall have a minimum additional travel of 50 percent between the design height and the solid height. Mounts shall be type FDS.

MINIMUM SPRING OUTSIDE DIAMETERS, INCHES

RATED DEFLECTION, INCHES

RATED CAPACITY -POUNDS-	UP TO 1.25	1.26 to 2.00	2.01 to 3.00
Up to 750	2.73	5.00	6.00
751 to 2500	4.00	5.00	7.00
2501 to 6000	5.00	7.00	8.50

2.04 "H" Mounts - Combination spring and fiberglass isolation "Hangers", incorporating 2" thick neoprene jacketed fiberglass inserts in series with spring, all encased in welded steel brackets. Minimum static deflection shall be as tabulated on the Drawings, and the spring shall have a minimum additional travel of 50 percent between the design height and the solid height. The hangers shall be type SFH.

2.05 Springs: All springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. All springs except internal nested springs shall have an outside diameter not less than 0.8 of the compressed height of the spring. Ends of springs shall be square and ground for stability. Laterally stable springs shall have k_x/k_y ratios of at least 0.9. All springs shall be fully color-coded to indicate capacity – color striping is not considered adequate.

2.06 Corrosion Protection: All springs shall be powder-coated enamel. Housings shall be galvanized, powder-coated enamel, or painted with rust-resistant paint. Hot-dipped galvanized housings shall be provided as indicated on the Schedule.

2.07 Restrained Spring Isolators: Type FLS – Vibration isolators for equipment which is subject to load variations and large external or torquing forces shall consist of large diameter laterally stable steel springs assembled into formed or welded steel housing assemblies designed to limit vertical movement of the supported equipment. Springs shall be supported either with a neoprene cup of a metal base plate complete with a ribbed neoprene pad, minimum 6 mm (0.25”) thick, bonded to the base plate. Housing assembly shall be formed or fabricated steel members and shall consist of a top-load plate complete with adjusting and leveling bolts, vertical restraints, isolation washers and a bottom plate with non-skid noise stop pads and holes provided for anchoring to supporting structure. Housing shall be hot dipped galvanized. Spring elements shall meet all the specified characteristics described in Section 2.1/E.1 paragraph. Vibration isolators shall be Model FLS-1, 1" deflection, as manufactured by Kinetics Noise Control, Inc.

2.08 Curb-Mounted Spring Rail: Type KSR – Full-perimeter rail type isolator, spring components shall be 2" deflection, free-standing, un-housed, laterally stable steel springs. Springs shall have a lateral stiffness greater than 1.0 times the rated vertical stiffness and shall be designed for 50% overload to solid. The spring element shall meet all the specified characteristics described in Section 2.01/E.1 paragraph. Springs shall be color coded to indicate load capacity. Rails shall provide continuous support for the rooftop equipment and shall be designed to provide isolation against casing-radiated vibration in the rooftop equipment housing and structure-borne vibration from rotating and mechanical equipment in the rooftop package. Rail assembly shall consist of extruded aluminum top and bottom members connected by spring isolators and a continuous air- and water-tight seal. The seal shall be a beaded elastomeric material

retained in a keyway along the top extrusion. The weather strip shall be sealed along the bottom with an aluminum fascia strip. Rail assemblies shall incorporate means for attachment to the building and the supported equipment and shall incorporate additional stiffening members if necessary to assure stability. Rails shall be fitted with wind restraint devices suitable for prevailing wind conditions that will not impose loads on the curb walls at 90 degrees to their long axis. Vibration isolators shall be selected by the manufacturer for each specific application to comply with deflection requirements as shown on the Vibration Isolation Schedule or as indicated on the project documents. Roof Curb Rails shall be Model KSR as manufactured by Kinetics Noise Control, Inc.

2.09 The isolator manufacturer's submittal shall include a tabulation of the design data on the isolators, including O.D., free, operating and solid heights of the springs, free and operating heights of the neoprene or fiberglass isolators, and isolation efficiency based on the lowest operating speed of the equipment supported.

2.10 ROOFTOP HVAC UNIT VIBRATION ISOLATION CURBS

A. The equipment shall be mounted on free-standing springs located within a rigid structural steel frame roof curb system, all provided by a single manufacturer. The structural steel frame within the roof curb shall comply with the requirements of Base Type 2. The top framing members shall overlap the bottom framing members to provide water runoff independent of the seal.

B. Steel spring vibration isolators shall be subject to the requirements of spring isolators identified for isolator Type A. The required isolator static deflections are shown on the drawings. The isolation curb system shall provide air and water tight seals between the rooftop curb and the rooftop equipment. The weather seal material shall consist of a resilient, elastomeric closed-cell sponge material both above and below the base, in addition to a waterproof EPDM connection joining the outside perimeter of the framing members.

C. The isolation curb system shall provide adequate wind and seismic stability per code requirements, without short circuiting the isolation system, accomplished through the use of snubbers, or other system approved by the Engineer and Acoustical Consultant.

D. Flexible neoprene or canvas duct connections shall be provided in supply and return air ducts connecting to the RTU housing. Where the duct connections occur under the unit, flex connections shall occur in-parallel with the vibration isolation springs.

2.11 Vibration isolation equipment as manufactured by Korfund Dynamics Corp., Mason Industries or Vibration Mountings and Controls, Inc. may be furnished at the contractor’s option.

PART 3 EXECUTION

3.01 Install flexible connections in all duct connections to all fans and air handling units.

3.02 Installation of all vibration isolation materials and supplemental equipment bases specified in this section shall be accomplished as per the manufacturer's written instructions and adjust mountings to level equipment.

3.03 On completion of installation (as per KNC provided installation documents) of all isolation materials and before startup of isolated equipment all debris shall be cleared from areas surrounding and from beneath all isolated equipment, leaving equipment free to move on the isolation supports.

3.04 No rigid connections between equipment and building structure shall be made that degrades the noise and vibration isolation system herein specified. Electrical conduit connections to isolated equipment shall be looped to allow free motion of isolated equipment.

3.05 Ensure pipe, duct and electrical connections to isolated equipment do not reduce system flexibility. Ensure that pipe, conduit and duct passing through walls and floors do not transmit vibrations.

3.06 VIBRATION ISOLATION INSPECTION

A. The contractor shall notify the local representative of the vibration isolation materials manufacturer prior to installing any vibration isolation devices. The contractor shall seek the representative's guidance in any installation procedures with which he is unfamiliar.

B. The local representative of the vibration isolation materials manufacturer shall conduct periodic inspections of the installation of materials herein specified, and shall report in writing to the contractor any deviations from good installation practice observed.

C. On completion of installation of all noise and vibration isolation devices herein specified, the local representative of the isolation materials manufacturer shall (only upon request as required) inspect the completed system and report in writing any installation errors, improperly selected isolation devices, or other fault in the system that could affect the performance of the system.

END OF SECTION

SECTION 23 05 53

TAGGING AND CODING

PART 1 GENERAL

1.01 SCOPE

A. Provide brass tags on all valves. Tags shall state type of line in which the valve is installed (cold water, etc.) and number of valve. Furnish a schedule or schedules of all valves tagged with number, location and purpose of each valve and mount schedules under glass on Equipment Room wall, or elsewhere as required. Schedules shall be located near and convenient to the valves on the schedule.

B. After piping and insulation is complete, this Contractor shall then have applied 2" wide color bands on each side of a stenciled legend, lettered with the name of contents of piping. Flow direction arrows of the same colors are to be located adjacent to the Identification Legends. Spacing not over 20 ft. apart and at least once in each room. Do not use adhesive markers. Color as follows:

1. Red - Fire Protection
2. Yellow - Dangerous materials
3. Green - Safe materials
4. Blue - Protective materials.

PART 2 PRODUCTS

2.01 Valve tags shall be brass, minimum 2" diameter, 16 gauge.

PART 3 EXECUTION

Not applicable.

END OF SECTION

SECTION 23 05 54

EQUIPMENT IDENTIFICATION

PART 1 GENERAL

1.01 SCOPE

A. This Contractor shall label all disconnects, motor starters, switches and equipment furnished under this Contract.

PART 2 PRODUCTS

2.01 Labels shall be 1/16" thick laminated plastic nameplates or 0.020" thick aluminum nameplates. Background shall be black with 3/16" letters engraved on the face. Letters shall be white or natural aluminum.

PART 3 EXECUTION

3.01 Secure plates with screws. Do not attach to covers where covers can be easily mixed up. Coordinate with the Temperature Control Subcontractor so that all nameplates are the same type and design.

END OF SECTION

SECTION 23 05 93

TESTS AND ADJUSTMENTS

PART 1 – GENERAL

1.01 SCOPE

A. After work has been completed but before pipe covering has been applied, the Contractor shall test and adjust the systems he has installed.

B. The Construction Manager shall be notified of all scheduled tests and adjustments at least 48 hours before they are scheduled so that he may witness same. If the Contractor performs any test or adjustment without the Construction Manager present or without properly notifying the Construction Manager, the Contractor will be required to perform the test or adjustment a second time in the presence of the Construction Manager.

C. If the Construction Manager determines that any work requires special inspection, testing, or approval, he will, upon written authorization from the Owner, instruct the Contractor to order such special inspection, testing or approval. The Contractor shall give timely notice so the Construction Manager may observe the inspections, tests or approvals. If such special inspection or testing reveals a failure of the work to comply with the requirements of the Contract Documents, the Contractor shall bear all costs thereof, including compensation for the Construction Manager's additional services made necessary by such failure; otherwise the Owner shall bear such costs, and an appropriate Change Order shall be issued.

D. Concealed lines shall be tested before being concealed. If this is not done and a leak appears during the final test, this Contractor shall repair leak and all damage resulting there from.

E. This Contractor shall adjust all his equipment in the mechanical system to obtain proper operation and shall demonstrate to the Owner and Construction Manager that the entire system will function properly.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.01 Testing High/Medium Velocity Ductwork Systems:

A. Each duct system shall be tested for air tightness by use of a small blower, water manometer and calibrated orifice.

B. Test pressure shall be one and one-half (1-1/2) times the design working pressure.

C. Air leakage loss indicated by the calibrated orifice shall not exceed one (1) percent of the total air handled by the particular system of section of system under test.

D. Allowable duct leakage shall not be confined to any one section of a system because of objectionable noise generation and concentration.

E. Before final connections to high velocity boxes are made with flex duct, the entire system shall be cleaned out and blown out.

F. The Construction Manager shall be notified so that he may witness all tests.

3.02 Balancing Air Systems:

A. This contractor shall procure the services of an independent company which specializes in the testing and balancing of air and water systems. All balancing work shall be done under the direct supervision of a qualified Heating and Ventilating Engineer. It shall be the responsibility of this Contractor to make all necessary arrangements with the Balancing Company for balancing the air and water systems after all equipment, ductwork, outlets, piping and accessories have been installed. A detailed report on all balancing work shall be prepared and submitted, in triplicate, to the Associate for review. Each copy of the report shall be dated, signed by the supervising Associate of the Balancing Company and bound in a suitable cover. The Balancing Company shall be selected by the Contractor from the following qualified firms:

1. Kahoe Air Balance Company
2. Any member of the Associated Air Balance Council
3. Any member of the NEBB

B. Provide necessary personnel as required to assist the BAS Contractor, Engineer and Owner in providing complete system operational testing. Provide all labor necessary to fine tune the rooftop unit and VAV box control sequences until they operate to the satisfaction of the BAS Contractor, Engineer and Owner.

C. Balancing procedures and report to be in accordance with procedures set forth by the Associated Air Balance Council. Report shall also include fan curves for all equipment.

D. Balance reports shall include starter element sizes, and amperage ratings for each motor. If starter elements amperage rating is more than 10 percent greater or less than motor nameplate amperage, this Contractor shall inform the Electrical Contractor to furnish and install proper size elements. Balance report shall include the corrected proper size starter element sizes and amperage ratings.

E. Air quantities at individual registers or diffusers shall be adjusted to within 10% of quantities shown on the Drawings and total air quantity handled by each system to within 5% of the quantity shown or specified.

F. Balance Subcontractor shall report by letter to the Engineer on preliminary results of balancing before the final balance report is prepared. This report shall include any problems encountered during balancing or major deviations from specified conditions.

G. If required, a meeting shall be arranged between this Contractor, the Balance Subcontractor and the Engineer to resolve any problems or deviations from the Contract Drawings and Specifications before the final balance work is completed and final report is submitted for review by the Engineer.

3.03 All dampers, damper operators and motor operated valves shall be checked and adjusted for proper operation and travel.

3.04 Before turning job over to Owner, inspect all valves and repack valves as necessary.

3.05 This Contractor shall adjust all equipment in the mechanical system to obtain proper operation and shall demonstrate to the Owner and Engineer that the entire system will function properly.

END OF SECTION

SECTION 23 05 94

PROTECTION AND CLEANING

PART 1 GENERAL

Not Applicable

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.01 Protect all mechanical equipment against damage from any cause whatsoever and pay the cost of replacing and repairing equipment made necessary by failure to provide suitable protection.

3.02 After all piping, equipment and ductwork has been approved and after all plastering has been completed, bare piping and insulation provided under this Contract shall be thoroughly cleaned of dirt, grease, rust and oil, and primed (where necessary), ready for painting.

3.03 Repair all dents and scratches in factory prime or finish coats on all mechanical equipment, including plumbing fixtures, to the satisfaction of the Construction Manager. If damage is excessive, replacement may be required.

3.04 Flush out all piping systems to remove all dirt and grease from pipes and equipment before systems are placed in operation. Clean strainers after each flushing until the strainer remains clean.

3.05 Ductwork and air handling equipment is to be cleaned out and blown out before painting is started by the painting subcontractor.

3.06 If heating units are operated for temporary heat during construction, this Contractor shall replace all throwaway and prefilter type filters before the building is turned over to the Owner. Filters must be in units at any time fans are operated.

3.07 Cover all motors, fans, pumps, open pipes, etc., to keep out dirt, water and weather during construction.

3.08 This Contractor shall clean up and remove all debris from the site and shall at all times keep the premises in a neat and orderly condition.

3.09 Ductwork shall be covered at all times to keep out dirt, debris, and moisture.

END OF SECTION

SECTION 23 05 96

SUBSTITUTIONS

PART 1 – GENERAL

1.01 SCOPE

A. The Base Bid shall be based on equipment as specified. Where items are mentioned thusly, "may be furnished at the Contractor's option", the Contractor may use any one of the items named for his Base Bid. Proposals for substitutions are welcomed, but must be noted separately from the Base Bid and applied for in writing at Bid submittal.

B. Any proposed equipment or material not specified or listed as an equal must be bid as a substitution.

C. Where the Contractor furnishes equipment or material specified as equal or which is accepted as a substitution, he is responsible for all modifications required for his work, and work of all other trades to install the equipment and insure performance as originally specified.

D. Equipment and materials furnished as equal or as a substitution must be equal in quality, design, features, performances, arrangement, and appearance to that specified as standard.

PART 2 - PRODUCTS

Not Applicable

PART3 - EXECUTION

Not Applicable

END OF SECTION

SECTION 23 07 00

HVAC INSULATION

PART 1 GENERAL

1.01 REFERENCE

A. Section 23 01 00 - Paragraph 1.05 - OHIO ENERGY CODE

1.02 SCOPE

A. Extent of Work - Insulate pipes and other surfaces as follows:

Supply Air Ductwork

PART 2 PRODUCTS

2.01 All insulating materials, including jackets, cements, adhesives, vapor barriers, etc., shall be U.L. listed with a flame spread rating not to exceed 25 and a smoke developed rating not to exceed 50.

2.02 Molded plastic fitting covers shall be U.L. approved with a flame spread rating not to exceed 25 and a smoke developed rating not to exceed 50.

2.03 Pipe insulation shall be Schueller "Micro-Lok" glass fiber insulation rated for 850°F. with factory applied AP-1 all purpose, self-sealing vapor barrier jacket. Butt strips shall be minimum 3" wide of same material as jacket.

2.04 Duct insulation shall be Schueller blanket flexible type or rigid type as noted with FSK glass fiber reinforced foil faced flame resistant kraft paper vapor barrier facing.

2.05 All cover above shall be by Schueller. Equivalent type thickness and conductivity insulation by Owens Corning, Knauf, or Certain Teed meeting all requirements may be furnished at the Contractor's option.

2.06 Insulation thicknesses are based on insulation having thermal resistance in the range of 4.0 Hr F $ft.^2$/BTU to 4.6 Hr F ft^2/BTU per inch of thickness on a flat surface at a mean temperature of 75°F. Minimum insulation thickness shall be increased for materials having R values less than 4.0 or may be reduced for materials having R values greater than 4.6 to give equivalent "R" values.

PART 3 EXECUTION

3.01 Cover all high pressure supply air ducts above ceilings as follows:

A. All supply air ducts ducts shall be insulated with 1-1/2" thick, 1 lb. density blanket flexible duct insulation.

B. Adhere insulation to duct surface with Foster No. 85-20 adhesive applied in 6" wide strips on 12" centers. Butt all edges of insulation and seal all joints with a foil-skrim-kraft tape or flange adhered over the joint. Secure insulation with flare door staples until the adhesive sets.

C. Seal all breaks and joints in vapor barrier with 2-1/2" wide pressure sensitive tape to match vapor barrier facing. Adhere with Foster 85-20 adhesive where necessary.

D. High pressure ductwork located inside the building which is required to be lined per Specification Section 23 31 13.14 does not require wrapping.

E. Cover all variable air volume box necks.

3.02 Cover all low pressure supply air ducts as follows:

A. All supply air ducts shall be insulated with 1-1/2" thick, 1 lb. density blanket flexible duct insulation.

B. Adhere insulation to duct surface with Foster No. 85-20 adhesive applied in 6" wide strips on 12" centers. Butt all edges of insulation and seal all joints with a foil-skrim-kraft tape or flange adhered over the joint. Secure insulation with flare door staples until the adhesive sets.

C. Seal all breaks and joints in vapor barrier with 2-1/2" wide pressure sensitive tape to match vapor barrier facing. Adhere with Foster 85-20 adhesive where necessary.

D. Cover all round low pressure supply air ductwork (including that on the downstream side of the air terminal boxes).

E. Return air ductwork inside the building is not required to be externally wrapped. Note that some rectangular return air ductwork shall be lined per specification section 23 31 13.13.

F. Low pressure ductwork located inside the building which is required to be lined per Specification Section 23 31 13.13 does not require wrapping.

3.03 Cover the top of all supply diffusers above ceilings when not in a return air plenum. Insulation to be 1-1/2" thick, 1 lb. density flexible blanket.

3.04 Application shall be made on clean, dry surfaces with all joints butted firmly together.

3.05 All duct and pipe insulation to be continuous through floors, walls, ceilings, roofs and pipe hangers.

3.06 Insulation shall not be applied until the general construction has progressed sufficiently to insure against physical or moisture damage to the insulation. All damaged insulation shall be replaced at this Contractor's expense.

3.07 Install 20 gauge galvanized steel insulation protectors on all insulated exposed pipes passing through floor. Sleeves to be 12" above the floor.

3.08 Hanger rods must be perpendicular before insulation is installed.

3.09 Longitudinal lap joints and butt strips for glass fiber pipe insulation shall be secured with staples or three (3") inch centers and sealed with an approved vapor barrier adhesive where applicable. Staples are not required when insulation utilizes a "double" adhesive self sealing system.

END OF SECTION

SECTION 23 31 13.13

LOW PRESSURE DUCTWORK

PART 1 GENERAL

1.01 REFERENCE

A. Section 23 07 00 - HVAC INSULATION
B. Section 23 33 13 - DAMPERS
C. Section 23 37 00 - REGISTERS, GRILLES AND DIFFUSERS

1.02 SCOPE

A. Furnish, install and insulate low pressure sheet metal work and appurtenances with sizes as shown on Drawings.

B. All sheet metal work including ductwork, dampers, etc., shall be fabricated in accordance with the recommendations of the Sheet Metal and Air Conditioning Contractors National Association, Inc., (SMACNA) latest edition of the FOLLOWING:

1. HVAC DUCT CONSTRUCTION STANDARDS, Metal and Flexible.

C. Where indicated on the Drawings and as noted herein, sheet metal ductwork shall be fabricated with a thermal and acoustical liner as hereinafter specified.

1. All rectangular supply air ducts.
2. All transfer ducts.

Metal nosings shall be securely installed over transversely oriented liner edges facing the airstream at forward discharge and at any point where lined duct is preceded by unlined duct.

D. All ducts shall be sealed with duct sealer.

E. The HVAC Contractor shall create 3-dimensional (3D) coordination model with ability to output 1/4" scale, color coded coordination drawings in PDF and DWG formats for use in coordinating all above ceiling work, including but not limited to structure, Plumbing, Fire Protection, Electrical, and Technology scope with the layout of air distribution and piping system. Lighting, ceiling systems (including grid), ceiling access doors, emergency shower heads, ceiling mounted projectors and all other ceiling mounted items and other scope impacting this coordination shall be shown to verify no conflicts exist.

The HVAC contractor shall provide coordination model to A/E within 60 days of award of contract. The HVAC Contractor is responsible for providing information as to size, elevation and location proposed for all components, and for coordination of work of all Subcontractors. Final resolution of all items to be

determined at project meetings held by the Construction Manager.

PART 2 PRODUCTS

2.01 Sheet Metal Ductwork:

A. Unless otherwise noted, all sheet metal ducts and plenums shall be fabricated of lock forming quality, hot-dipped galvanized steel sheets and shall comply with 2" w.g. pressure class construction. Metal gauges shall be in accordance with current SMACNA Standards.

B. Flexible duct shall comply with NFPA requirements, Pamphlet 90A, and shall be UL listed with flame spread rating of 25 or less and smoke developed rating of 50 or less. Duct shall be a factory fabricated assembly composed of: an inner duct of woven and coated fiber glass providing an air seal and bonded permanently to corrosion resistant coated steel wire helix and 1" thick fiber glass insulating blanket and low permeability outer vapor barrier of fiber glass reinforced metallized film laminate.

Flexible duct shall be terminal duct for air system and shall not exceed 5 feet in length. Do not make more than one (1) 90 degree bend with flexible duct. Bend radius shall be minimum of two (2) times duct diameter.

1. Flexible duct shall be Thermaflex MKC.

2. Duct shall be rated for minimum 10" W.G. internal working pressure, for all duct sizes.

3. Vinyl, clear plastic or mylar type liners are expressly prohibited.

4. Flexmaster Type 3M insulated flexible duct meeting all specified requirements may be furnished at the Contractor's option.

C. All fan flexible connections shall be made with commercial grade neoprene coated glass fabric (heavy duty).

D. Dryer exhaust ducts shall be constructed of 26 gauge aluminum with joints sealed water tight.

E. All duct sealing compounds, mastics and duct tape shall meet NFPA 90A standards and shall be UL listed with ratings not to exceed 25 for flame spread and 50 for smoke development.

F. Access doors shall be insulated, airtight, “hinged” and gasketed style, with a minimum of two quick action latches. Door shall be mounted in a galvanized steel frame with an inside “fold-over” flange for duct attachment. Door height shall be 24”; width shall be equal to the duct width or 12”, whichever is less, unless otherwise shown or noted on drawings.

G. Sealer for ducts shall be equal to 3M Model EC-800.

2.02 DUCT LINER

A. Duct liner shall be 1" thick, R-4.2, flexible thermal and acoustical insulation manufactured of fiber-free closed-cell elastomeric foam equal to Armacell AP Armaflex. Liner shall conform to the requirements for flexible duct liner material as outlined in the SMACNA "HVAC Duct Construction Standards".

B. Adhesive shall be fire retardant, and formulated for duct liner application service. Adhesive shall conform to the requirements for classification Type 1, as outlined in the SMACNA "HVAC Duct Construction Standard". Adhesive shall be approved by the duct liner manufacturer for use with their product.

C. Liner and adhesives shall have flame spread classification of less than 25, and smoke developed ratings of less than 50.

D. Equal fiber free duct liners by Rubatex may be furnished at the contractor's option.

PART 3 EXECUTION

3.01 SHEET METAL DUCTS

A. Except as noted or shown otherwise on the Drawings, all sheet metal work including ductwork, dampers, etc., shall be fabricated and supported in accordance with the recommendations of the SMACNA "HVAC Duct Construction Standards".

B. Cross break all flat surfaces or reinforce with a bead approximately 5/16" wide x 3/16" deep on 12" centers, to prevent vibration on all ducts 19" maximum dimension and larger.

C. Sheet metal plenums shall be single wall construction, reinforced with steel angles 2 ft. on center. Provide hinged access doors where shown on the Drawings. Provide close off sheet metal as required. Provide neoprene sponge gaskets between filter frames and housing for mixed air plenums. Gauges same as specified for ducts, unless otherwise noted. At the Contractor's option, sheet metal ducts and plenums may be put together using "Ductmate" or "TDC Lockformer" couplings.

D. Seal all seams and joints in outside air plenums. Pitch plenums to low points and drain all low points in the system. All plenums to be watertight.

3.02 LINED DUCTWORK

A. All portions of duct designed to receive duct liner shall be completely covered with 1" thick duct liner unless otherwise noted. All liner for return air ducts shall be 1" thick. All liner for supply air ductwork shall be 1" thick.

B. The smooth, black coated surfaces of the liner shall face the airstream. All liner shall be cut to assure tight, overlapped corner joints. The top pieces shall be supported by the side pieces.

C. Liner shall be adhered to the sheetmetal with full coverage of an approved adhesive, and all exposed leading edges and transverse joints shall be neatly butted without gaps and be coated with Permacote factory-applied edge coating. Shop or filed cuts shall be liberally coated with Johns Manville SuperSeal Edge Treatment or approved adhesive.

D. The liner shall be additionally secured with mechanical fasteners spaced per the manufacturer's recommendations. The pin length should be such as to hold the material firmly in place with minimum compression of the material.

E. Liner shall be kept clean and dry during transportation, storage and installation. Care should be taken to protect the liner from exposure to the elements or damage from mechanical abuse.

F. Omit liner for a distance of approximately 6" where dampers are installed in ducts to permit proper fit of dampers.

G. Seal all leading edges of liner, including at duct joint, coils and dampers, with a thick coat of Johns Manville SuperSeal Edge Treatment.

H. Liner installation shall comply with the recommendations of the SMACNA "HVAC Duct Construction Standard".

3.03 FLEXIBLE AND ROUND DUCT CONNECTIONS

A. Connection of flexible and round ducts to rectangular ducts to be made with spin-in type fittings complete with damper with locking operator.

3.04 FITTINGS AND ACCESSORIES

A. Install flexible connections in all duct connections to fans and air handling units, unless otherwise noted.

B. Install manual balancing dampers with locking quadrants where shown on the Drawings and as required for proper balancing of the systems. Locking quadrants shall be easily accessible. On insulated ducts, locking quadrants shall be installed on outside of insulation.

C. Install double turning vanes in all right angle elbows. Install 45° tap collar for branch ducts and register openings.

D. Provide access doors in ducts to all fire dampers and elsewhere as shown on drawings unless otherwise noted. Access doors at fire dampers shall be located so that fire dampers may be reopened from them in case of fusible link failure.

E. All duct joints in duct systems shall be made tight. Duct sealer shall be used to seal joints.

F. All round ductwork and fittings shall be spiral lockseam construction equivalent to United Sheet Metal.

G. The use of multi-piece adjustable angles and elbows is prohibited.

3.05 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:
1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual."
2. Test the following systems:
a. Supply air.
b. Exhaust air.
3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before insulation application.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.

C. Duct leakage tests shall be observed by the General Contractor's Quality Control on-site representative. General Contractor is to maintain on-site a set of ductwork prints that are shaded in different color to show duct sections isolated for each test. Contractor shall indicate on the prints the date each section of duct was tested and the final percentage leakage rate measured for each test section.

D. Duct System Cleanliness Tests- Random sampled locations:
1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test selected sections of metal duct systems, chosen by engineer and/or owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

E. Duct system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.06 DUCT CLEANING

A. Duct systems shall be assembled from pre-cleaned sections and kept clean prior to testing.
1. At contractor’s opting all duct systems may be cleaned in the field after erection, prior to testing using the following cleaning procedure.
2. If a duct system fails the random duct cleanliness test the entire duct system will be required to be cleaned per the following cleaning procedure will be required and the duct system will be required to be re-tested for cleanliness.

3. If all of the random sampled test locations of the duct system pass the duct cleanliness testing duct will be considered acceptable and no further cleaning will be required.
4. or may be cleaned new duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.
1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:
1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:
1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:
1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct

surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.

4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

END OF SECTION

SECTION 23 31 13.14

HIGH PRESSURE DUCTWORK

PART 1 GENERAL

1.01 REFERENCE

A. Section 23 05 93 - TESTS AND ADJUSTMENTS
B. Section 23 07 00 - HVAC INSULATION
C. Section 23 37 13 - REGISTERS, GRILLES AND DIFFUSERS
D. Section 23 33 13 – DAMPERS
E. Section 23 31 13.13 – LOW PRESSURE DUCTWORK

1.02 SCOPE

A. Furnish and install high pressure, high velocity sheet metal work and appurtenances with sizes as shown on Drawings.

B. All sheet metal work on the discharge side of air handling units/rooftop units up to the VAV/constant volume boxes shall be high pressure construction. All fume hood exhaust air duct from the fume hoods to the roof mounted exhaust fans shall also be high pressure construction.

C. All sheet metal work including ductwork, dampers, etc., shall be fabricated in accordance with the recommendations of the Sheet Metal and Air conditioning Contractors National Association, Inc., (SMACNA) latest edition of the "HVAC Duct Construction Standards, Metal and Flexible".

D. The HVAC Contractor shall create 3-dimensional (3D) coordination model with ability to output 1/4" scale, color coded coordination drawings in PDF and DWG formats for use in coordinating all above ceiling work, including but not limited to structure, Plumbing, Fire Protection, Electrical, and Technology scope with the layout of air distribution and piping system. Lighting, ceiling systems (including grid), ceiling access doors, emergency shower heads, ceiling mounted projectors and all other ceiling mounted items and other scope impacting this coordination shall be shown to verify no conflicts exist.

The HVAC contractor shall provide coordination model to A/E within 60 days of award of contract. The HVAC Contractor is responsible for providing information as to size, elevation and location proposed for all components, and for coordination of work of all Subcontractors. Final resolution of all items to be determined at project meetings held by the Construction Manager.

PART 2 PRODUCTS

2.01 All high pressure ducts shall be galvanized steel (unless otherwise noted) and shall comply with 4” w.g. pressure class construction in accordance with current SMACNA Standards.

2.02 All round ducts shall be spiral lockseam construction of gauges as recommended by SMACNA.

2.03 All rectangular ducts shall conform to SMACNA standards. At contractors option joints maybe put together using “K-lock”, “Ductmate”, or “TDC Lockformer” couplings.

2.04 All flat oval ducts shall be spiral lockseam construction of gauges as recommended by SMACNA.

2.05 All flat oval duct sections shall not be more than 12 foot long and reinforced with angle braces at each joint and as a minimum at the mid-point between joints of each section. Spacing between braces shall not exceed duct manufacturer’s recommendation.

2.06 All fittings shall be manufactured from 20 gauge zinc-coated steel with continuous corrosion resistant welds.

2.07 All 90 degree elbows in size 3" through 8" diameter shall be die- stamped for minimum air friction loss with continuous corrosion- resistant welds.

2.08 Elbows - 9" diameter and over - 5-piece fabrication.

2.09 Square elbows - Mitered 90 degrees with minimum 4 or 5 turning vanes.

2.10 Tees and laterals - low loss conical type fittings straight or reducing as required.

2.11 Couplings, end caps, slip joints, concentric reducer and transitions to be standard fittings.

2.12 All access doors shall be 20 gauge, (U. S. Standard) reinforced, insulated, gasketed doors with sufficient quick opening fasterners to insure a tight seal, and provided with chain retainer and cover handle. Doors to open inward to serve as vacuum release devices.

2.13 All round oval high velocity ductwork and fittings shall be as manufactured by United Sheet Metal, Semco, Tangent Air or Eastern.

2.14 Fire dampers in high velocity ductwork shall be Type "C" with interlocking hinged blades out of the airstream. All dampers shall be UL approved and labeled and shall meet all requirements of NFPA No. 90A. Furnish with UL labeled fusible links with temperature ranges to conform to NFPA recommendations. All fire dampers shall be dynamic type.

2.15 Flexible duct shall comply with NFPA requirements, Pamphlet 90A, and shall be UL listed with flame spread rating of 25 or less and smoke developed rating of 50 or less. Duct shall be a factory fabricated assembly composed of: an inner duct of woven and coated fiber glass providing an air seal and bonded permanently to corrosion resistant coated steel wire helix and 1" thick fiber glass insulating blanket and low permeability outer vapor barrier of fiber glass reinforced metallized film laminate.

Flexible duct shall be terminal duct for air system and shall not exceed 5 feet in length. Do not make more than one (1) 90 degree bend with flexible duct. Bend radius shall be minimum of two (2) times duct diameter.

1. Flexible duct shall be Thermaflex MKC.

2. Duct shall be rated for minimum 10" W.G. internal working pressure, for all duct sizes.

3. Vinyl, clear plastic or mylar type liners are expressly prohibited.

4. Flexmaster Type 3M insulated or Wiremold WCK flexible duct meeting all specified requirements may be furnished at the Contractor's option.

2.16 All duct sealing compounds, mastics and duct tape shall meet NFPA 90A Standards and shall be UL listed with ratings not to exceed 25 for flame spread and 50 for smoke development.

2.17 The fume hood exhaust air ductwork from the fume hoods to the exhaust fans shall be welded 316L stainless steel.

PART 3 EXECUTION

3.01 The conduit shall have been tested for leakage rate, friction loss, bursting and collapsing strength by a reputable independent engineering laboratory. Certified copies of these tests shall be supplied upon request. Material not meeting accepted industry standards will be rejected.

3.02 All circumferential joints shall be slip joints properly sealed with sealing compound inside the joint and mechanically fastened with drive screws. Use minimum number of drive screws to allow sealing compound to set properly. Coat outside of joint with sealing compound and apply layer of duct tape before compound dries.

3.03 Construct square rectangular ducts and transitions with duct sealer in seams. Use mastic or suitable soft gaskets in joints. Bolt flanges with 1/4" bolts maximum 6" on centers.

3.04 See "Tests and Adjustments" Section for testing of high pressure sheet metal work.

3.05 Provide access doors adjacent to all fire dampers, and control devices. Access doors at fire dampers shall be located so that fire dampers may be reopened from them in case of fusible link failure. All access doors shall be installed with sufficient quick opening fasteners to insure a tight seal.

3.06 Install flexible connections in all duct connections to all fans. All flexible connections shall be made with commercial grade neoprene coated glass fabric (heavy duty).

3.07 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:
   1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual."
   2. Test the following systems:
      a. Supply air.
      b. Exhaust air.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before insulation application.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.

C. Duct leakage tests shall be observed by the General Contractor's Quality Control on-site representative. General Contractor is to maintain on-site a set of ductwork prints that are shaded in different color to show duct sections isolated for each test. Contractor shall indicate on the prints the date each section of duct was tested and the final percentage leakage rate measured for each test section.

D. Duct System Cleanliness Tests- Random sampled locations:
1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test selected sections of metal duct systems, chosen by engineer and/or owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

E. Duct system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.08 DUCT CLEANING

A. Duct systems shall be assembled from pre-cleaned sections and kept clean prior to testing.
1. At contractor’s opting all duct systems may be cleaned in the field after erection, prior to testing using the following cleaning procedure.
2. If a duct system fails the random duct cleanliness test the entire duct system will be required to be cleaned per the following cleaning procedure will be required and the duct system will be required to be re-tested for cleanliness.
3. If all of the random sampled test locations of the duct system pass the duct cleanliness testing duct will be considered acceptable and no further cleaning will be required.
4. or may be cleaned new duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.
1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:
   1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
   2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:
   1. Air outlets and inlets (registers, grilles, and diffusers).
   2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
   3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
   4. Coils and related components.
   5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
   6. Supply-air ducts, dampers, actuators, and turning vanes.
   7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:
   1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
   2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
   3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
   4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
   5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
   6. Provide drainage and cleanup for wash-down procedures.
   7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

END OF SECTION

SECTION 23 32 05

PARALLEL FAN POWERED VAV BOXES

PART 1 GENERAL

1.1 REFERENCE

A. Section 23 01 00, Paragraph 1.05 - ENERGY CODE
B. Section 23 31 13.13 - LOW PRESSURE DUCTWORK
C. Section 23 31 13.14 - HIGH PRESSURE DUCTWORK
D. Section 25 00 00 - TEMPERATURE CONTROLS

1.2 SCOPE

A. Furnish and install parallel fan powered boxes with electric actuator for air volume control, inlet valves and variable constant volume device. Sizes, capacities and noise levels as scheduled on the drawings.

B. Box shall be provided with a direct digital controller and electronic actuator furnished by the Temperature Control Contractor.

PART 2 PRODUCTS

2.1 Fan powered boxes shall be Titus type DFLP low profile boxes as hereinafter specified. Units shall have factory catalogued performance ratings which conform to CFM, static pressure, discharge and radiated sound power designated.

A. Cabinets shall be constructed of not lighter than 22 gauge, galvanized steel. Internal surfaces shall be acoustically and thermally insulated with 1" glass fiber material surface-treated to prevent erosion and having UL approval meeting NBFU 90A and NFPA. Entire bottom panel shall be removable.
B. Primary Air Valve shall be an 18-gage galvanized steel cylinder sized to fit standard round duct. A multiple-point, averaging flow sensing ring is provided with balancing taps for measuring +/-5% of unit cataloged airflow. An airflow-versus-pressure differential calibration chart is provided. The damper blade is constructed of a closed-cell foam seal that is mechanically locked between two 22-gage galvanized steel disks. The damper blade assembly is connected to a cast zinc shaft supported by self-lubricating bearings. The shaft is cast with a damper position indicator. The valve assembly includes a mechanical stop to prevent over-stroking. At 4 in. wg, air valve leakage does not exceed 1% of cataloged airflow.
C. Boxes shall be set for minimums noted on the drawings.
D. Performance of units shall be based on tests conducted in accordance with ADC Standard 1061Rs and ASHRAE Standard 36B.
E. Unit shall be provided with electric heating coil mounted at discharge outlet with flanged connection. Electric coil shall be factory provided and mounted, U.L. listed, resistance open type heater with a disc-type automatic thermal primary safety device and manual reset thermal secondary cutout. Heater element material shall be nickel-chromium. Terminal connections shall be plated steel with ceramic or phenolic insulators.
F. Leakage of valves in fully closed position shall not exceed 1% of rated capacity at 4" w.g.
G. The Temperature Control Subcontractor shall ship the DDC controllers for the box to the box manufacturer. The box manufacturer shall mount and wire the box motor and controller. Only low voltage power and communication control connections shall be made in the field.

H. Maximum "raw" box sound levels, radiated or discharge, shall not exceed NC 30 when operating at design air volume and 1½" static pressure differential. No credit shall be taken for room attenuation or lined duct beyond that stated on drawings
I. Minimum inlet SP requirement shall not exceed 0.25".
J. Motor shall be permanently lubricated, direct drive permanent split capacitor type. Thermal overload protection shall be provided. Motor shall be designed specifically for use with an open SCR. Motor shall accommodate anti-backward rotation at start up. Maximum motor temperature rise on all speeds of 55ºC. Fan motors shall be 120 volt, single phase, 60 Hertz. Motor and fan assembly are isolated from terminal casing using rubber isolators.
K. Fan speed control shall be factory mounted, SCR speed control device as standard and shall allow the operator infinite fan speed adjustment. Fan shall be provided with disconnect switch.
L. Boxes shall be provided with interlocking door disconnect switch and airflow switch.
M. Boxes shall have 1" pleated MERV 8 filter.
N. A factory-provided door interlocking disconnect switch shall be provided on the heater control panel to disengage primary voltage to the terminal.
O. A power safety fuse shall be provided in the electric heater's line of power to prevent power surge damage to the electric heater.

2.2 Units shall be UL listed with a flame spread rating not to exceed 25 and a smoke development rating not in excess of 50.

2.3 Boxes shall be factory adjusted to deliver the specified air quantities within 5%. Each box shall be labeled with the capacity as adjusted and furnished with a calibration chart. Pressure taps shall be provided to measure pressure drop across unit to confirm CFM.

2.4 All boxes located above the ceiling shall be end outlet.

2.5 All boxes shall deliver the air quantities shown on the Drawings at sound levels not to exceed the manufacturer's published sound levels for the units indicated on the Drawings.

2. 6 Variable volume boxes by Trane or Price meeting all specified requirements, may be furnished at the Contractor's option.

PART 3 EXECUTION

3.1 Provide flexible connection at inlet to all boxes. Boxes shall be installed with at least two duct diameters of rigid straight duct attached directly to box inlets.

3.2 Install all boxes with NEC required clearance in front of electric heater access doors. Coordinate requirements with other trades.

3.3 Provide additional steel as required to support boxes.

3.4 Operating sequence of boxes shall be as described under Section 25 00 00, Temperature Controls.

END OF SECTION

SECTION 23 33 13

LOUVERS AND DAMPERS

PART 1 GENERAL

1.01 REFERENCE

A. Section 23 31 13.13 - LOW PRESSURE DUCTWORK

1.02 SCOPE

A. Furnish and install dampers and appurtenances with size and capacities as shown on Drawings.

PART 2 PRODUCTS

2.01 MANUAL BALANCING DAMPERS

A. Based on Ruskin Type MD-35/0B opposed blade with molded synthetic bearings, 6" wide 16 gauge galvanized steel blades, extended shaft and linkage.

1. Balance dampers for round ducts shall be Ruskin MDRS- 25 single blade, 20 gauge galvanized steel.

2. All dampers shall be equipped with locking quadrants.

B. At the Contractor's option, manual balancing dampers shall be manufactured by the Contractor per SMACNA Standards. Dampers shall have locking quadrants on both sides of the duct.

2.02 MOTOR OPERATED DAMPERS

A. Motor operated dampers shall be Ruskin Type CD-50, opposed blade with self-lubricating molded synthetic bearings, 5" X 1" X .125-6063 T5 extruded aluminum hat channel with hat mounting flanges on both sides of frame. 6" wide 6063 T5 heavy gauge extruded aluminum airfoil shape blades. Anti-leakage jamb seals, vinyl gasket blade seals, extended shaft and linkage. Maximum allowable leakage through dampers, 6 CFM per sq. ft. at 4" of static pressure behind louver. All dampers shall be equipped with multiple 120 volt, 60 cycle, single phase motor operators as required. Spring closed.

2.03 FIRE DAMPERS

A. Fire dampers in low velocity ductwork shall be Ruskin model DIBD2 Dynamic Type "B" with interlocking hinged blades out of the airstream unless otherwise noted. All dampers shall be UL approved and labeled and shall meet all requirements of NFPA No. 90A. Furnish with UL labeled fusible links with temperature ranges to conform to NFPA recommendations. All fire dampers shall be dynamic type.

1. Furnish and install, at locations shown on the plans, dynamic fire dampers tested, constructed and labeled in accordance with the latest edition of UL Standard 555. Dampers shall have a fire rating of 11/2 hours and shall meet the requirements of the latest edition of NFPA90A.

2. Each damper shall include a 165°F fusible link and shall be labeled for use in dynamic systems. Dampers labeled for use in static systems only are not permitted. The damper shall be rated for dynamic closure at 2000 fpm and 4 inches w.g. static pressure and shall be rated to close with airflow in either direction.

3. Each dynamic fire damper shall include a steel sleeve and mounting angles furnished by the damper manufacturer to ensure appropriate installation. Submittal information shall include the fire protection rating, maximum velocity/pressure ratings and the manufacturer's UL installation instructions. The dampers shall be installed in accordance with the manufacturer's UL installation instructions.

B. Fire dampers in high velocity ductwork shall be Ruskin multiple blade type FD60. All dampers shall be UL approved and labeled and shall meet all requirements of NFPA No. 90A. Furnish with UL labeled fusible links with temperature ranges to conform to NFPA recommendations. All dampers shall be dynamic type.

1. Furnish and install at locations shown on plans or as described in schedules multiple blade fire dampers constructed and tested in accordance with UL Safety Standard 555 that meet or exceed the following specifications. Damper frame (when size permits) shall be constructed using the UniFrame Design Concept (UDC) and shall be a minimum of 16 gage galvanized (1.52) steel formed into a structural hat shaped steel channel structurally superior to 13 gage (2.3) channel frame. The blades shall be single piece, airfoil shaped with 14 gage (1.90) equivalent thickness. Bearings shall be stainless steel sleeve turning in an extruded hole in the frame.

2. Each fire damper shall have a 11/2 hour fire protection rating, 165°F fusible link, and shall have been tested to close under dynamic airflow conditions in a multiple section size with pressures up to 8" and velocities up to 4000 fpm. In addition, the dampers shall be AMCA licensed for air performance and shall bear the AMCA Certified Ratings Seal.

3. Fire dampers shall be approved for vertical or horizontal installation as required by the location shown and shall be installed using steel sleeves, angles, and other materials and practices required to provide an installation in accordance with the damper manufacturer's UL approved instructions.

2.05 STATIONARY LOUVERS

A. Heavy duty, drainable blade type, sightproof stationary louvers shall be Airolite K605D, 5" deep of 12 gauge (.081") extruded aluminum with 1/2" aluminum mesh birdscreen inside. Blades shall be horizontal, inverted V type with a center hook and spaced 2" on center. Louvers shall be certified to be weathertight

when handling CFM's indicated on drawings. For comparison purposes, a 4'-0" x 4'-0" louver must have a minimum free area of 9.11 sq. ft. and a maximum pressure drop of 0.09" at 500 FPM through free area (intake). Water penetration shall be no more than 0.01 ounces of water per square foot of free area when tested for 15 minutes at 1134 FPM per AMCA Standard 500-L. Louvers shall have AMCA certified rating seal. Provide data with submittals. Louvers to have continuous blade appearance.

B. Louver to have Kynar finish with color chosen by Architect.

2.06 Louvers and Dampers by Ruskin, Air Balance, Arrow, American Warming and Ventilating, or Vent Products of the same type and meeting specified requirements, may be furnished at the Contractor's option.

PART 3 EXECUTION

3.01 Install louvers and dampers as recommended by manufacturer.

3.02 Provide insulated sheet metal blank off panel behind louvers in all shell areas.

END OF SECTION

SECTION 23 34 20

SQUARE CENTRIFUGAL INLINE FANS

PART 1 GENERAL

1.01 Reference

A. Section 23 01 05, Paragraph 1.05 - OHIO ENERGY CODE
B. Section 23 05 13 - ELECTRICAL WORK

1.02 Scope

A. Furnish and install duct mounted inline fans and appurtenances.

PART 2 PRODUCTS

2.01 Inline fans based on Greenheck Model BSQ (belt-drive) or SQ (direct-drive) centrifugal exhausters, with balanced backward inclined type wheel, motor, pillow block ball bearings in lined galvanized steel casing and vibration isolators. Fans shall have factory mounted disconnect.

2.02 The fan housing shall be of the square design constructed of heavy gauge galvanized steel and shall include square duct mounting collars.

2.03 Fan construction shall include two removable access panels located perpendicular to the motor mounting panel. The access panels must be of sufficient size to permit easy access to all interior components.

2.04 The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.

2.05 Fan ratings shall be AMCA certified and fan shall bear AMCA seals.

2.06 Motors for belt drive units shall be 1750 RPM, 460 volt, 3 phase, 60 cycle, open drip-proof with sealed pre-lubricated ball bearings. Motors 1/2 HP and larger shall be high efficiency type Baldor Premium Efficiency meeting Ohio Energy Code and have 1.15 service factor. Motor shall be mounted on an adjustable base. Drive shall be V-belt type, designed for 125% of motor horsepower, with solid fan sheaves and adjustable motor sheaves. Furnish additional sheaves and belts as required to adjust fans to deliver specified air quantities at actual system static pressures. Furnish OSHA belt guard with opening at end of fan shaft.

2.07 Motors for direct drive fans shall be a electronically commutated (EC) motors specifically designed for fan applications. AC induction type motors are not acceptable. Examples of unacceptable motors are: Shaded Pole, Permanent Split Capacitor (PSC), Split Phase, Capacitor Start and 3 phase induction type

motors. Motors shall be permanently lubricated with heavy-duty ball bearings to match the fan load and prewired to the specific voltage and phase. Internal motor circuitry shall convert AC power supplied to the fan to DC power to operate the motor. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by either a potentiometer dial mounted on the motor or by a 0-10 VDC signal. Motor shall be a minimum of 85% efficient at all speeds.

2.08 Inline fans by Cook, Penn-Berry, or Twin City, of the same type, size and meeting capacity requirements, may be furnished at the Contractor's option.

PART 3 EXECUTION

3.01 Provide flexible connections at inlet and discharge ducts.

3.02 Mount unit from spring vibration isolators furnished with the unit minimum 90% efficient.

3.03 Auxiliary steel for supporting units to be furnished and installed by the HVAC Contractor.

3.04 Starter and wiring by Electrical Contractor.

END OF SECTION

SECTION 23 37 13

REGISTERS, GRILLES AND DIFFUSERS

PART 1 - GENERAL

1.1 REFERENCE

A. Section 23 31 13.13 - LOW PRESSURE DUCTWORK

1.2 SCOPE

A. Furnish and install registers, grilles, diffusers and appurtenances.

PART 2 - PRODUCTS

2.1 SQUARE CEILING SUPPLY AIR DIFFUSERS

A. Adjustable air pattern steel square ceiling diffusers with round neck. Air pattern to be adjustable from full horizontal to full vertical.

1. Price SCDA with Border Type 3 frame to fit into lay-in ceiling grid.

2.2 RETURN AND EXHAUST AIR GRILLES

A. Grilles with curved horizontal face bars, fixed at 45 degrees, with blades parallel to the long grille dimension

1. Price Model 530, steel, lay-in.
2. Provide plaster trim frame for all lay-in grilles located in gypsum board ceilings.

2.3 LINEAR SUPPLY AIR DIFFUSERS

A. Extruded aluminum straight line diffusers with concealed keyways and alignment clips. Number of slots, direction of blow, size and capacities as shown on the drawings. Install manual dampers in branch ducts to linear diffusers. Units hall have integral volume and pattern control. Air pattern to be adjustable from full horizontal to full vertical. Pattern controllers must be capable of shutoff for each slot.

1. Price Model SDS, adjustable throw. See Drawings for slot width and quantity. Furnish with 14” high insulated plenum; match plenum connection sizes with the duct sizes indicated on the drawings. Coordinate border type with air terminal schedule.

2.4 Color of grilles, registers, and diffusers in other than white ceilings as selected by the Architect.

2.5 Registers, grilles and diffusers by Nailor, Titus, or Krueger of the same type, size and meeting other specified requirements may be furnished at the Contractor's option.

PART 3 - EXECUTION

3.1 All grilles, registers, and diffusers shall be furnished with factory prime coat of paint. Outlets in ceilings shall be furnished with factory white finish unless otherwise noted.

3.2 Diffusers in ceilings shall have flush appearance and shall initially be set by the HVAC contractor for horizontal air pattern distribution.

3.3 Manufacturer's drawings shall include the "K" factor for use with an Alnor Velometer for each size and type of register, grille and diffuser furnished.

3.4 Furnish frames and trim compatible with ceilings shown on Architectural drawings. Verify the grid face dimension of the ceiling suspension system for all lay-in devices. Furnish narrow tee type devices where required.

3.5 All diffusers shall be installed with equalizing grid.

3.6 Provide additional support hangers for diffusers, grilles and registers mounted in lay-in ceiling tiles.

END OF SECTION

SECTION 25 00 00

TEMPERATURE CONTROLS

PART 1 GENERAL

1.1 REFERENCES

A. Section 23 01 05, Paragraph 1.05 - ENERGY CODE
B. Section 23 05 13 - ELECTRICAL WORK
C. Section 23 32 00 – FAN POWERED VAV BOXES
D. Section 23 75 00 - VAV ROOFTOP UNITS

1.2 SCOPE

A. The building automation system contractor shall provide additional controls integrated into the existing building BacNet DDC building automation system (BAS) manufactured by Automated Logic Controls (ALC) to monitor and control the operation of the new and relocated equipment installed in this project. The new equipment controls shall be fully integrated into a native BacNet FX virtual private network (VPN) by the BAS contractor. All graphic displays will be updated on the existing building controllers. In addition, the system shall perform the said integration through the use of BacNet. All integration work shall be performed in cooperation with (ALC). Failure to mention any specific item or device does not relieve the contractor of the responsibility for installing or integrating such device/peripheral in order to comply with the intent of the drawings or this specification and on the drawings. The terms “temperature control contractor” and “building automation system contractor” are used synonymously in this specification. This specification is to be used to define scope responsibilities between the HVAC, mechanical, electrical and bas contractor and the sequence of operations. The contractor shall provide the new ALC system with the capability to control all existing building systems such as Rooftop units, Split systems, VAV boxes, Fan powered boxes, computer room AC units, water heaters, exhaust fans, sump pumps, ect., and future equipment. The existing controls system shall remain in operation to control the existing equipment as part of this project, future renovations shall migrate existing and future equipment to the new ALC system.

B. Building automation system (BAS) installer shall provide:

1. A fully integrated building automation system (BAS) as manufactured by ALC, UL listed, incorporating direct digital control (DDC) for energy management, equipment monitoring and control.

2. Control system to be DDC as specified herein.

3. All wiring, conduit and panels associated with the DDC system.

4. All final electrical connections to each DDC controller. Pick up power immediately outside of panel.

5. Bas installer shall provide coordination of communications with all equipment and devices specified and provided as part of this project. Coordinate with the associated manufacturers to provide appropriate interface devices where required.

6. Bas installer shall be responsible for all electrical work associated with the bas control system and as called for on the drawings.

   A) Perform all wiring in accordance with all local and national codes.

   B) Install all line voltage wiring, concealed or exposed, in accordance with division 26.

   C) Electrical contractor shall provide 120 volt, 20 amp circuits and circuit breakers from normal and/or emergency power panel for direct digital control systems.

   D) Surge transient protection shall be incorporated in design of system to protect electrical components in all DDC controllers.

   E) All 120v wiring throughout the building whether exposed or concealed shall be run in conduit in accordance with division 26. All horizontal low voltage temperature control wiring located above 10 feet above the floor can be run as plenum rated cable and does not need to be installed in conduit. Vertical low voltage temperature control wiring shall be installed in conduit from the device being served to the point the wire turns horizontal in the joist or ceiling space. Low voltage temperature control wiring located above ceilings shall be plenum rated cable and does not need to be installed in conduit. Cables shall be supported by the building structure in such a manner that the cable will not be damaged by normal building use. Such cables shall be secured by j-hooks, hangers, or similar fittings designed and installed so as not to damage the cable.

   F) All 24v power shall be by the bas installer and the HVAC contractor.

   g) Control wiring for unit heaters and ventilation fan thermostats.

C. HVAC Contractor provides:

   1. All wells and openings for water monitoring devices, flow switches, and alarms furnished by the BAS Contractor.

   2. Installation of control devices, alarms, monitoring devices, and control valves.

   3. All package unit control panels.

   4. Installation of airflow monitoring devices, openings for flow switches, and alarms furnished by the BAS Contractor.

   5. Installation of smoke dampers; outdoor air, return air, exhaust air and vent dampers; with adjacent access doors.

D. Electrical Contractor provides:

   1. Run 120V power circuit to the control power transformer panel provided by the BAS Contractor.

1.3 MANUFACTURERS:

A. Basis of Design: Automated Logic Controls

1.4 QUALITY ASSURANCE

A. Materials and equipment shall be the catalogued products of manufacturers regularly engaged in production and installation of automatic temperature control systems and shall be manufacturer's latest standard design that complies with the specification requirements.

B. Install system using competent workmen who are fully trained in the installation of temperature control equipment.

C. Single-source responsibility of the BAS supplier shall be to supply all ALC Controls equipment, engineering, project management and coordination with the HVAC contractor for the complete installation and proper operation of the BAS. The BAS Contractor shall include as part of their scope of work, in coordination with the HVAC contractor, debugging and proper calibration of each component in the entire system.

D. Supplier shall have an in-place support facility within 100 miles of the site with technical staff, spare parts inventory and all necessary test and diagnostic equipment.

E. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Section 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.

F. Design and build all system components to be fault-tolerant.

1. Satisfactory operation without damage at 110% and 85% of rated voltage and at plus 3 Hertz variation in line frequency.

2. Static, transient and short-circuit protection on all inputs and outputs.

3. Protect communication lines against incorrect wiring, static transients and induced magnetic interference.

4. Network-connected devices to be A.C. coupled or equivalent so that any single device failure will not disrupt or halt network communication.

5. All real time clocks and data file RAM to be battery-backed for a minimum 72 hours and include local and system low battery indication.

6. All programs shall retain their memory for a minimum of 7 days upon loss of power.

G. The BAS Installer shall have a competent Project Manager who is able to answer field questions, is aware of all schedules and schedule changes, and is responsible for the BAS Installer’s work and the coordination of their work with all other trades. This Project Manager shall be available for on site and shall respond to design, programming, and equipment related questions. Failure to provide the above services shall be considered a substantial breech of Contract Documents.

1.5 SUBMITTALS

A. Submit ten (10) complete sets of documentation.

1. Manufacturer's Product Data:

a. All equipment components

2. Shop Drawings:

a. System wiring diagrams with sequence of operation for each system as specified.

b. Submit manufacturer's product information on all hardware items along with descriptive literature for all software programs to show compliance with specifications.

c. System configuration diagram showing all panel types and locations as well as communications network and workstations.

B. Where installation procedures, or any part thereof, are required to be in accord with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Engineer prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received.

1.6 JOB CONDITIONS

A. Coordinate the exact location of this work with the work of other trades prior to fabrication or installation of same and verify all dimensions and elevations. Provide additional offsets and sections of wiring, conduit, etc., as may be required to meet the applicable job condition requirements. Coordinate with and review all related Drawings of all trades prior to start of work.

B. Before any specified work is considered acceptable and approved for payment, a walk-through with the controls manufacturer's agent and an authorized representative of the Associate shall be scheduled with the Associate. Work not meeting the sequence of controls and job specifications shall be subjected to rework at no charge to the Owner or Associate until acceptable by the Associate. No job will be considered complete for payment until all corrections are complete and "closeout information" has been submitted by the Contractor.

C. All low-voltage (120 volt and less) control and interlock wiring shall be provided by the BAS contractor. In addition, it is the responsibility of the BAS contractor to review the scope of work and extent of HVAC system items that are presently included to be wired by the Electrical Contractor within the electrical part of the Specification and Drawing Documents.

D. Any additional safety, pressure, or other related devices and switches that are not presently within the Electrical Contractor's scope of work shall be properly wired, per required codes, etc., by the BAS contractor, and shall also include wiring of same to electric and/or control panels along with providing any and all required temperature control and interlock system monitoring, final connectors, etc. for a completely operable system.

E. Wiring systems for the control, interlock, and supervisory systems are to be selected by the controls subcontractor to match and be compatible with the equipment being furnished and served. Wire, conduit, and fittings are to meet the National Electrical Code and all applicable state and local codes. Run conduits straight and parallel with building lines. Support conduit at least every four feet on centers. The entire installation is to meet the requirements of the electrical codes and Division 16.

F. Interfacing of the BAS to various building systems and equipment: The BAS shall communicate to the various systems through the BACnet communications interface. Coordinate integration with equipment/system and supplier/manufacturer.

1.7 COMMISSIONING

A. Provide necessary personnel as required to assist the Engineer and Owner in providing complete system operational testing. Provide all labor necessary to fine tune the control sequences until they operate to the satisfaction of the Engineer and Owner.

PART 2 PRODUCTS

2.1 CONTROL SYSTEM - GENERAL

A. Manufacturer Requirements

1. The system shall be provided by ALC as installed by the BAS contractor.

2. Control devices may not be of varied manufacturers whose products are capable of meeting performance requirements. All control devices of the same type shall be by the same manufacturer.

3. System Contractor is responsible for quality and satisfactory operation of devices and for overall performance of system.

4. Supplier shall have an in-place support facility within 50 miles of the site with technical staff, spare parts inventory, and all necessary testing and diagnostic equipment.

B. Temperature Control System: Automatic electronic, microprocessor-based DDC system with electric actuators to include computer hardware, software, wiring, conduit, switches, relays, sensors, thermostats, control valves, dampers, operator workstation, portable operators terminal and other control components required to maintain conditions described in detail on the Drawings and within this section, as well as other accessories.

1. ALC shall provide any additional controls equipment and control wiring required to meet intent of these specifications and make a complete system.

C. General Product Description

1. The building automation system (BAS) shall integrate multiple building functions including equipment supervision and control, alarm management, energy management, and historical data collection.

2. The building automation system shall consist of the following:

a. Stand-alone DDC Controllers

b. ALC DDC Controllers

3. The system shall be modular in nature and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, DDC Controllers, Applications Specific Controllers, and operator devices. A total of 10% spare capacity for expansion shall be provided.

4. DDC Controllers shall be able to access any data from, or send control commands and alarm reports directly to, any other DDC Controller or combination of controllers on the network without dependence upon a central processing device. DDC Controllers shall also be able to send alarm reports to multiple operator workstations without dependence upon a central processing device.

2.2 SYSTEM LEVEL CONTROL

A. The system level controller shall communicate with all Unit Controllers and act as the central coordinator for all individual equipment devices. It shall gather data from unit controllers, schedule and coordinate equipment operations, monitor for abnormal situations, and perform other miscellaneous building management and system-level functions.

B. With owner permission, the BAS system may utilize the Owner's IT infrastructure within the facility for the ELNC provided the bandwidth construction is less than 5% of the total network bandwidth. Under no circumstances, shall the owner's network be subject to failure and/or abuse.

C. BACnet compatible systems that employ the use of proprietary "Gateways" will not be accepted.

2.3 UNIT CONTROL

A. Unit controllers shall provide all necessary unit control functions. They shall operate individual pieces of equipment including VAV boxes, Unitary equipment, etc. Controllers shall be microprocessor-based.

B. Unit controllers shall perform its assigned monitoring and control functions as a stand-alone unit. The system controller shall perform it full monitoring and control functions including energy management.

C. Provide battery back-up for volatile memory including real time clock for 24 hours. System controller restart will be implemented on power restoration and include automatic recharging of battery. Controller utilizing "super" capacitors to maintain time clock do not require a battery back-up.

D. Each controller shall include a local RS-232 communications port for display of analog values, binary inputs, status, and manual control of all binary outputs.

E. All alarms and all deviation alarms will sound an alarm to the system level controller. Locally, an operator can initiate a scan and identify all alarm conditions and their identifiers on the local I/O.

F. The DDC system shall be capable of performing all the energy management functions necessary to reduce energy consumption. These programs will include, but not be limited to:

1. Optimal start using adaptive algorithm to prevent the need for manual adjustment of parameters.
2. Client Tailored Programs: The library of routines available in firmware must be capable of generating additional as may be required for specific client requirements.

G. The Temperature Control Subcontractor shall ship the DDC controllers for all terminal boxes to the box manufacturer. The box manufacturer shall mount and wire the box motor and controller. Only low voltage power and communication control connections shall be made in the field.

2.4 WORKSTATION OPERATOR INTERFACE

A. Basic Interface Description

1. Operator workstation interface software shall minimize operator training through the use of English language prompting, English language point identification, and industry standard PC application software. The software shall provide, as a minimum, the following functionality:

a. Graphical viewing and control of environment
b. Scheduling and override of building operations
c. Collection and analysis of historical data
d. Definition and construction of dynamic color graphic displays
e. Editing, programming, storage, and downloading of controller databases

B. Dynamic Color Graphic Displays

1. Color graphic floor plan displays and system schematics for each piece of HVAC equipment, including air handling units, chilled water systems, and hot water boiler systems, shall be provided by the BAS Contractor as indicated in the point I/O summary of this specification to optimize system performance analysis and speed alarm recognition.

2. The operator interface shall allow users to access the various system schematics and floor plans via a graphical penetration scheme, menu selection, or text-based commands.

3. Dynamic temperature values, humidity values, flow values, and status indication shall be shown in their actual respective locations and shall automatically update to represent current conditions without operator intervention.

2.5 INPUT DEVICES

A. Temperature Sensors

1. General Requirements:

a. The temperature sensor shall be of the resistance type, and shall be either two-wire 1000 ohm nickel RTD, or two-wire 1000 ohm platinum RTD.

b. The following point types (and the accuracy of each) are required, and their associated accuracy values include errors associated with the sensor, lead wire, and A to D conversion:

Point Type	Accuracy
Heating Hot Water	+ .5°F.
Room Temp	+ .5°F.
Duct Temperature	+ .5°F.
All Others	+ .75°F.

2. Room Temperature Sensors

a. Room sensors shall be constructed for either surface or wallbox-mounting.

b. Room sensors shall have the following options when specified:

1) Setpoint reset slide switch providing a +3 degree (adjustable) range.
2) Individual heating/cooling setpoint slide switches.
3) A momentary override request push button for activation of after-hours operation.
4) Analog thermometer.

c. All temperature sensors serving banks of Conference Rooms shall be wireless. The wireless device shall be capable of easily moving from one room to another based on space occupancy (without the use of tools). Provide attractive mounting brackets in each room to accommodate sensor relocation.

B. Differential Pressure Transmitters

1. General Air and Water Pressure Transmitter Requirements:

a. Pressure transmitters shall be constructed to withstand 100% pressure over-range without damage, and to hold calibrated accuracy when subject to a momentary 40% over-range input.

b. Pressure transmitters shall transmit a 0 to 5 VDC, 0 to 10 VDC, or 4 to 20 mA output signal.

c. Differential pressure transmitters used for flow measurement shall be sized to the flow-sensing device, and shall be supplied with Tee fittings and shut-off valves in the high and low sensing pick-up lines to allow the balancing Contractor and Owner permanent, easy-to-use connection.

d. A minimum of a NEMA 1 housing shall be provided for the transmitter. Transmitters shall be located in accessible local control panels wherever possible.

2. Low Differential Air Pressure Applications (0” to 5” w.c.)

a. The differential pressure transmitter shall be of industrial quality and transmit a linear 4 to 20 mA output in response to variation of differential pressure or air pressure-sensing points.

b. The differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications:
   1) (0.00 - 1.00” to 5.00”) w.c. input differential pressure ranges.
   2) 4-20 mA output.
   3) Maintain accuracy up to 20 to 1 ratio turn-down.
   4) Reference Accuracy: +0.2% of full span.

C. Power Monitoring Devices

1. Current Measurement (Amps)

a. Current measurement shall be by a combination current transformer and a current transducer. The current transformer shall be sized to reduce the full amperage of the monitored circuit to a maximum 5-amp signal, which will be converted to a 4-20 mA DDC compatible signal for use by the building automation system.

b. Current Transformer – A split-core current transformer shall be provided to monitor motor amps.
   1) Operating frequency – 50 - 400 Hz.
   2) Insulation – 0.6 Kv class 10Kv BIL.
   3) UL-recognized.
   4) Five-amp secondary.
   5) Select current ration as appropriate for application.
   6) Acceptable manufacturers: Veris Industries.

c. Current Transducer – A current to voltage or current to mA transducer shall be provided. The current transducer shall include:
   1) 6X input over amp rating for AC inrushes of up to 120 amps.
   2) Manufactured to UL 1244.
   3) Accuracy: +.5%, Ripple +1%.
   4) Minimum load resistance 30kohm.
   5) Input 0-20 amps.
   6) Output 4-20 mA.
   7) Transducer shall be powered by a 24VDC regulated power supply (24 VDC +5%).
   8) Acceptable manufacturers: Veris Industries.

D. Status and Safety Switches

1. General Requirements

a. Switches shall be provided to monitor equipment status, safety conditions, and generate alarms at the BAS when a failure or abnormal condition occurs. Safety switches shall be provided with two sets of contacts and shall be interlock-wired to shut down respective equipment.

2. Current Sensing Switches

a. The current sensing switch shall be self-powered with solid-state circuitry and a dry contact output. It shall consist of a current transformer, a solid-state current sensing circuit, adjustable trip point, solid state switch, SPDT relay, and an LED indicating the on or off status. A conductor of the load shall be passed through the window of the device. It shall accept over-current up to twice its trip point range.

b. Current sensing switches shall be used for run status for fans, pumps, and other miscellaneous motor loads.

c. Current sensing switches shall be calibrated to show a positive run status only when the motor is operating under load. A motor running with a broken belt or coupling shall indicate a negative run status.

d. Acceptable manufacturers: Veris Industries.

3. Air Flow Switches

a. Differential pressure flow switches shall be bellows-actuated mercury switches or snap acting micro-switches with appropriate scale range and differential adjustment for intended service.

2.6 OUTPUT DEVICES

A. Actuators

1. General Requirements

a. Damper and valve actuators shall be electronic, as specified in the System Description section.

2. Electronic Damper Actuators

a. Electronic damper actuators shall be direct shaft-mount.

b. Modulating and two-position actuators shall be provided as required by the sequence of operations. Damper sections shall be sized based on actuator manufacturer's recommendations for face velocity, differential pressure, and damper type. The actuator mounting arrangement and spring return feature shall permit normally open or normally closed positions of the dampers, as required. All actuators (except terminal units) shall be furnished with mechanical spring return unless otherwise specified in the sequence of operations. All actuators shall have external adjustable stops to limit the travel in either direction and a gear release to allow manual positioning.

c. Modulating actuators shall accept 24 VAC or VDC power supply, shall consume no more than 15 VA, and shall be UL-listed. The control signal shall be 2-10 VDC or 4-20 mA, and the actuator shall provide a clamp position feedback signal of 2-10 VDC. The feedback signal shall be independent of the input signal and may be used to parallel other

actuators and provide true position indication. The feedback signal of one damper actuator for each separately controlled damper shall be wired back to a terminal strip in the control panel for trouble-shooting purposes.

d. Two-position or open/closed actuators shall accept 24 or 120 VAC power supply and be UL-listed. Isolation, smoke, exhaust fan, and other dampers, as specified in the sequence of operations, shall be furnished with adjustable end switches to indicate open/closed position, or be hard-wired to start/stop associated fan. Two-position actuators, as specified in sequence of operations as “quick-acting,” shall move full stroke within 20 seconds. All smoke damper actuators shall be quick-acting.

B. Electronic Signal Isolation Transducers

1. A signal isolation transducer shall be provided whenever an analog output signal from the building automation system is to be connected to an external control system as an input (such as a chiller control panel), or is to receive as an input signal from a remote system.

2. The signal isolation transducer shall provide ground plane isolation between systems.

3. Signals shall provide optical isolation between systems.

4. Acceptable manufacturers: Advanced Control Technologies.

C. External Manual Override Stations

1. External manual override stations shall provide the following:

a. An integral HAND/OFF/AUTO switch shall override the controlled device pilot relay.

b. A status input to the building automation system shall indicate whenever the switch is not in the automatic position.

c. A Status LED shall illuminate whenever the output is ON.

4. An Override LED shall illuminate whenever the HOA switch is in either the HAND or OFF position.

5. Contacts shall be rated for a minimum of 1 amp at 24 VAC.

2.7 MISCELLANEOUS DEVICES

A. Local Control Panels

1. All control panels shall be factory-constructed, incorporating the BAS manufacturer’s standard designs and layouts. All control panels shall be UL-inspected and listed as an assembly and carry a UL 508 label listing compliance. Control panels shall be fully enclosed, with sub-panel, hinged door, and key-locking latch.

2. In general, the control panels shall consist of the DDC Controller(s), display module, and I/O devices—such as relays, transducers, and so forth—that are not required to be located external to the control panel due to function. The display module shall be flush mounted in the panel face unless otherwise noted.

3. All I/O connections on the DDC Controller shall be extended to a numbered, color-coded, and labeled terminal strip for ease of maintenance and expansion. Wiring to I/O devices shall be made from this terminal strip.

4. All other wiring in the panel, internal and external, shall be made to additional line or low voltage color-coded and labeled terminal strips. Low and line voltage wiring shall be segregated. All terminal strips and wiring shall be UL-listed, 300-volt service, and shall provide adequate clearance for field wiring.

5. All wiring for every control panel shall follow a common color-coded format. All terminal strip color coding and numbering shall follow a common format. All wiring shall be neatly installed in plastic trays or tie-wrapped.

6. A convenience 120 VAC duplex receptacle shall be provided in each enclosure, fused on/off power switch, and required transformers.

B. Power Supplies

1. DC power supplies shall be sized for the connected device load. Total rated load shall not exceed 75% of the rated capacity of the power supply.

2. Input: 120 VAC +10%, 60 Hz.

3. Output: 24 VDC.

4. Line Regulation: +0.05% for 10% line change.

5. Load Regulation: +0.05% for 50% load change.

6. Ripple and Noise: 1 mV rms, 5 mV peak-to-peak.

7. An appropriately sized fuse and fuse block shall be provided and located next to the power supply.

8. A power disconnect switch shall be provided next to the power supply.

C. Thermostats: Electric room thermostats of the heavy-duty type shall be provided for unit heaters, cabinet unit heaters, and ventilation fans, where required. All these items shall be provided with concealed adjustment. Finish of covers for all room-type instruments shall match and, unless otherwise indicated or specified, covers shall be manufacturer's standard finish.

PART 3 EXECUTION

3.1 WIRING AND CONDUIT

A. All control wiring incidental to the Temperature Control System shall be by the BAS contractor except as follows:

1. Wiring shown on the Electrical Contract Drawings shall be wired by the Electrical Contractor.

B. All temperature control panels shall be completely prewired by the Temperature Control Manufacturer to terminal strips within the control cabinet. Provide 20 amp toggle switch to disconnect power at each panel. All internal interlock wiring within the control panel shall be complete to the terminal strips.

C. All exposed wiring, including low voltage, shall be installed in conduit. All wiring, conduit and installation shall be in accordance with the latest edition of the National Electrical Code and the requirements of Division 16 Electrical Specification, except low voltage wiring may be of the type and size recommended by the BAS Manufacturer.

D. Low voltage wiring concealed above accessible ceilings does not require conduit except as required in air plenums. Open wiring shall be bundled and supported at 3 ft. intervals with a system of J-hooks and plastic tie-wraps secured to permanent building structure.

E. All conduit and conduit installation, including conduit utilized for plastic pneumatic tubing, shall be in accordance with the requirements of Division 16, Electrical Specification.

3.2 TEMPERATURE CONTROL SYSTEM DIAGRAMS

A. Complete Temperature Control System diagrams including motor control schematics, wiring diagrams and a written description of the system operation shall be provided by the Temperature Control System Installer. Diagrams shall include face elevations of the temperature control panels.

B. Prepare, as a part of Temperature Control System shop drawings, complete terminal-to-terminal wiring diagrams. These will show terminal designations on control items and equipment. Wiring diagrams to be compatible with Electrical Drawings.

C. The Control diagrams, along with product literature on all system components shall be submitted as "Shop Drawings" for review by the Associate prior to starting work. Submit two sets of drawings for "preliminary" review before making a formal submittal.

D. Control diagrams, laminated in plastic or in full size heavy plastic binders with mounting rings, shall be hung adjacent to each control panel showing all schematic diagrams and descriptions related to the systems served by that panel.

E. Furnish four (4) complete sets of Operating and Maintenance Instructions for Temperature Controls, including control diagrams, to the HVAC Contractor for inclusion in the "Operating and Maintenance Manuals". Record control drawings must show set points and spring ranges.

3.3 CALIBRATION

A. Inasmuch as controllers are factory calibrated and controlled devices have nominal operating ranges, different from actual field conditions, all controllers shall be calibrated and set for the actual field conditions.

3.4 SUPERVISION

A. All temperature controls shall be installed, and calibrated under the supervision of a qualified representative of the Temperature Control System Manufacturer. The

Temperature Control System Manufacturer shall certify in writing the qualification of the installing company.

3.5 SEQUENCES OF OPERATIONS

A. Fan Powered VAV Boxes:

1. The DDC controller for each fan powered box shall be provided to the box manufacturer for factory installation by the temperature controls contractor. The DDC controller for each Fan Powered VAV box (provided by the Temperature Control Contractor) shall modulate its volume damper (open/closed) in response to deviation from setpoint (74 degrees F., adjustable) of its respective zone sensor. The electronic controller will also measure air flow and maintain the zone air volume within maximum and minimum flow settings (adjustable). This volume regulation will compensate for variations in duct supply static pressure (Pressure Independent Control). If the space is below setpoint, the electronic controller will provide the following heating sequence:

Stage 1: Close volume damper or valve to minimum position.
Stage 2: Start VAV fan and draw available heat from return plenum.
Stage 3: Energize 1st stage of electric heat
Stage 4: Energize 2nd stage of electric heat

2. Unit Status Report: For each Fan Powered VAV box, the unit controller shall provide an operating status summary of the following information to provide the operator with critical box operating data.

a. Zone temperature
b. Zone setpoint
c. Zone airflow
d. Box status
e. Provide occupied / unoccupied setpoints as initiated by the DDC system

B. Exhaust Fans

1. Fitness Area Exhaust Fan (EF-1): Start/stop/status via DDC system based on time of day. Fans shall be on during occupied hours and hours off during unoccupied hours. The associated motor operated damper shall be open when the fan is on and closed when the fan is off.

C. Control Flexibility

1. All devices being controlled by the DDC system such as valves, dampers, etc., shall each have a separate output from the DDC system unless otherwise noted.

D. Alarms

a. All alarms shall be both audible and visual at the central monitoring station. Visual alarms shall be shown on hard copy printouts and graphics. All audible alarms shall be signaled through the central monitoring stations.

3.6 ON-SITE TESTING / SYSTEM COMMISSIONING

A. Provide Owner-approved operation and acceptance testing of the complete system. The Owner will witness all tests.

B. Field Test: When installation of the system is complete, calibrate equipment and verify transmission media operation before the system is placed on-line. All testing, calibrating, adjusting and final field tests shall be completed by the installer. Provide a detailed cross-check of each sensor within the system by making a comparison between the reading at the sensor and a standard traceable to the National Bureau of Standards. Provide a cross-check of each control point within the system by making a comparison between the control command and the field-controlled device. Verify that all systems are operable from local controls in the specified failure mode upon panel failure or loss of power. Submit the results of functional and diagnostic tests and calibrations to the Engineer for final system acceptance.

3.7 SERVICE AND GUARANTEE

A. General Requirements: Provide all services, materials and equipment necessary for the successful operation of the entire DDC system for a period of one year after completion of successful performance test. Provide necessary material required for the work. Minimize impacts on facility operations when performing scheduled adjustments and non-scheduled work.

B. Description of Work: The adjustment and repair of the system includes all computer equipment, software updates, transmission equipment and all sensors and control devices. Provide the manufacturer's required adjustments and all other work necessary.

C. Personnel: Provide qualified personnel to accomplish all work promptly and satisfactorily. The Owner’s Representative shall be advised in writing of the name of the designated service representative, and of any changes in personnel.

D. Systems Modifications: Provide any recommendations for system modification in writing to the Owner’s Representative. Do not make any system modifications, including operating parameters and control settings, without prior approval of the Owner’s Representative. Any modifications made to the system shall be incorporated into the operations and maintenance manuals, and other documentation affected.

E. Software: Provide all software updates and verify operation in the system. These updates shall be accomplished in a timely manner, fully coordinated with the system operators, and shall be incorporated into the operations and maintenance manuals, and software documentation.

3.8 TRAINING

A. All training shall be by the BAS manufacturer and shall utilize specified manuals, as built documentation and online help utility. Operator training shall include a minimum of (8) hours of training encompassing, but not limited to, the following:

1. Sequence of Operation Review
2. Sign on – Sign off
3. Selection of all displays and reports
4. Commanding of points, keyboard and mouse mode
5. Modifying English text
6. Use all dialogue boxes and menus
7. Modifying warning limits, alarm limits and start-stop times
8. System initiation
9. Download and initiation of all stand-alone DDC panels and ASCs
10. Troubleshooting of sensors

11. System Maintenance Procedures

END OF SECTION

SECTION 26 00 10

GENERAL PROVISIONS

PART 1 - GENERAL

1.01 REFERENCE

A. The General Conditions and other Contract Documents as set forth in the foregoing pages are hereby incorporated into and become a part of the Specifications for work under this title.

B. All Specifications under this Division Title are directed to and are the responsibility of the Electrical Contractor. Unless other trades or persons are specifically mentioned, "Electrical Contractor" is inferred and intended.

1.02 CONTRACT DRAWINGS

A. The Drawings accompanying these Specifications are complementary each to the other and what is called for by one shall be as if called for by both.

B. Consult all Contract Drawings that may affect the location of equipment, conduit and wiring and make minor adjustments in location to secure coordination.

C. Wiring layout is schematic and exact locations shall be determined by structural and other conditions. This does not mean that the design of the system may be changed. It refers only to the exact locations of conduit and equipment to fit into the building as constructed and with the coordination of conduit and other equipment with piping and equipment included under other divisions of the Specifications.

D. Coordinate layout of Electrical work with other trades. Make minor adjustments in location required for coordination. Locations of structural systems, heating work and plumbing lines shall take preference over locations of conduit lines where conflict occurs.

E. Other than minor adjustments shall be submitted to the A/E for approval before proceeding with the work.

F. The location of outlets and switches shown on the Drawings is approximate, and the A/E shall have the right to relocate any outlets or switches before they are installed without additional cost.

G. The first manufacturer listed in these Specifications or on the drawings, in schedule or coded note form, is the basis for design. Any manufacturers listed below this base manufacturer are considered to be other acceptable manufacturers. It shall be the responsibility of the Contractor and the Supplier to

coordinate these other acceptable manufacturers' equipment with all building trades and building architecture. The other acceptable manufacturers' products shall match the base manufacturer's products in size, quality and performance.

1.03 MANUFACTURER'S DRAWINGS

A. The Contractor shall submit to the A/E for review six (6) copies of manufacturer's drawings and wiring diagrams. A highly-legible (not printed and scanned) electronic copy in PDF format may be submitted at this Contractor's option. The A/E will review Contractor's shop drawings and related submittals, as indicated below, with respect to the ability of the detailed work, when complete, to be a properly functioning integral element of the overall system designed by the A/E. Before submitting a shop drawing or any related material to the A/E, Contractor shall: review each such submission for conformance with the means, methods, techniques, sequences, operations of construction, safety precautions and programs all of which are the sole responsibility of Contractor. Contractor shall approve each such submission by stamping each submittal before submitting it. The A/E shall assume that no shop drawing or related submittal comprises a variation unless Contractor advises the A/E otherwise. The items, types of submittals and related material are indicated below:

ITEMS	TYPE SUBMITTALS REQUIRED
Lighting and Power Panels	Shop Drawings
Conduit	Shop Drawings
Disconnect Switches	Catalog Cuts
Surface Raceway	Shop Drawings
Wiring Devices and Plates	Catalog Cuts
Lighting Fixtures, LED's, and Drivers	Catalog Cuts
Communications System	Shop Drawings
Fire Alarm System	Sealed Shop Drawings
Lighting Controls	Catalog Cuts

B. The A/E shall return shop drawings and related materials with comments provided that each submission has been called for and is stamped by Contractor as indicated above. The A/E shall return, without comment, material not called for or which Contractor has not approved.

C. A/E's review of Manufacturer's Drawings or Schedules shall not relieve the Contractor from responsibility for errors or omissions in Manufacturer's Drawings or Schedules and deviation from A/E's Drawings or Specifications.

D. At the completion of the Job before final payment is made, the Contractor shall submit one (1) copy of Manufacturer's "As-Built" Drawings for A/E inclusion in record drawings. Included with the Drawings shall be The Operating and Maintenance Manuals as called for in Section 26 01 20.

1.04 JOB-SITE COPY OF DOCUMENTS

A. Maintain at the site, one copy of all Drawings, Specifications, Addenda, approved Shop Drawings, Change Orders and other modifications, in good order. The Drawings shall be marked to record all changes made during construction, especially deviations made necessary to incorporate equipment different from base equipment specified. These shall be available to the A/E. The Drawings shall be marked to record all changes made during construction and shall be delivered to the A/E for the University upon completion of the work. The A/E will furnish an additional set of Drawings for this purpose upon request.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All materials shall be new and undeteriorated and of a quality not less than the minimum specified.

B. Materials and equipment for which there are Underwriters' Laboratories (UL) Standard requirements, listing and labels shall have listing of Underwriters' Laboratories and be so labeled.

2.02 GUARANTEES

A. The Electrical Contractor shall be responsible for all defects, repairs and replacements in materials and workmanship for a period of one (1) year after final written acceptance by the A/E.

B. Product guarantees greater than one (1) year shall be passed along to the University for full benefit of the manufacturer's warranty.

2.03 QUANTITIES

A. Items may be referred to as singular or plural on the Drawings and in the Specifications. The Contractor is responsible for determining quantity of each item required.

2.04 PROHIBITED MATERIALS AND CONSTRUCTION PRACTICES

A. Extra-flexible non-labeled conduit:
B. Plastic conduit for interior electrical use, except that PVC conduit may be used for power circuits below basement concrete floors and for ground wires in any location. The transition from PVC to steel shall be made below the floor and shall be galvanized rigid steel conduit.
C. Electrical Nonmetallic Tubing (ENT) or “Blue Tube”.
D. Steel conduit shall not be used outside unless in concrete. Use aluminum conduit outside and wet locations above grade.
E. Use of aluminum plated bus and aluminum wound transformers is prohibited in all Ohio State University projects.
F. Use of Incompatible Materials: Aluminum fittings and boxes shall not be used with steel conduit. All materials in a raceway system shall be compatible.

G. Power actuated anchors or plug anchorage using wood, lead, or plastic.
H. Multi-use Suspension Systems: Piggyback suspension systems for conduits, fixtures, etc. are prohibited. All suspensions must be hung independently from structure, or, in limited cases, from trapeze suspension systems.
I. Use of wire ties to support conduit.
    a. Exception: Flexible conduit for fixture whips may be supported with UV stable cable ties.
J. Use of wood strips and wood screws to support lighting fixtures.
K. Use of Class J fuses unless permitted otherwise in the Ohio State University Building Design Standards. (Permitted use: Elevator shunt trip fused switches)
L. Direct burial electrical cable at any voltage.
M. Electrical ducts crossing above gas piping.
N. Ducts within 10 feet of a buried steam line in any direction. If it becomes necessary to cross a steam line, acceptable insulation of the crossing must be approved by the Utilities High Voltage Services, Facilities Operations and Development.
O. Hard insulated wire connectors, which have Bakelite or Ceramic insulation, and “push-in” type connectors are prohibited.
P. Armored cable (BX, AC, etc.)
    a. Exception: MC Cable (Metallic cable with green ground wire) may be used where permitted in the Ohio State University Building Design Standards.
Q. Non-metallic sheathed cable.
R. Flat conductor cable type FCC, under carpet, etc.
S. Fluorescent fixtures using 4-foot, 2-foot, U-tubes or compact fluorescent lamps is prohibited.
T. Die cast setscrew and die cast compression type fittings outdoors.
U. Bottom fed switches, breakers or fuses, unless permitted by the University Engineer.
V. Use of cable tray with primary conductors.
W. Time clock controls used on exterior or security lighting.
X. Use of busway other than as permitted in Section 26 05 35.11.
Y. Use of bus way for panel risers.
Z. Tapping existing switchgear, switchboards, panelboards, and motor control centers to provide power for new feeders or equipment shall be prohibited in all University facilities.
AA. Troffers: Use of radiant ceiling panels.
BB. General Duty Safety Switches
CC. Custom Built Lighting Fixtures unless permitted by the University Engineer.
DD. Recessed step lighting fixtures
EE. Exterior wall recessed mounted lighting fixtures.
FF. Flush mounted in-ground fixtures
GG. Exposed wiring of any type in mechanical and/or electrical rooms.
HH. Top entry in any exterior electrical equipment.
II. Use of Series rated equipment.
JJ. Vacuum breakers or vacuum switches.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Furnish and install all necessary hangers, supports, straps, boxes, fittings and other similar appurtenances not indicated on the Drawings but which are required for a complete and properly installed system consistent with the Architectural treatment of the building.

B. Contractor shall inform himself fully regarding peculiarities and limitations of space available for installation of materials and apparatuses under this contract, and see that all equipment necessary to be reached from time to time for operation and maintenance are made easily accessible. Clearances, when possible, shall be greater than those required by Code.

C. At least 6'-6" clear headroom must be maintained in front of all electrical equipment. Provide clear work space in front of electrical equipment as follows:

Equipment Voltage	Clear Space
208/120 Volt	3’-0”
480/277 Volt	3'-6"

The same clear work space is required at the rear of rear access equipment.

3.02 WORKMANSHIP

A. Electrical work shall meet or exceed the standards of installation and workmanship set forth in the latest edition of the National Electrical Contractors Association publication entitled National Electrical Installation Standards, except as otherwise modified in these Specifications or shown on the Drawings.

B. The A/E or University reserves the right to direct the removal and replacement of any item which, in his opinion, does not present an orderly, neat or workmanlike appearance, provided that such item can be properly installed in an orderly way by methods usual in such work, or which does not comply with the contract drawings or these Specifications. Perform such removals or replacements when directed in writing by the A/E and at the Contractor's expense.

C. The Electrical Contractor shall at all times keep the premises in a neat and orderly condition, and at the completion of the work shall properly clean up and cart away debris and excess materials.

END OF SECTION

SECTION 26 00 20

WORK INCLUDED

PART 1 - GENERAL

1.01 SCOPE

A. The scope of the work includes all the work indicated on the project drawings and specified herein. The Contractor assuming responsibility for the Electrical Contract shall be responsible for; all work indicated on the “E” series drawings; all references on any other drawings as being “by the Electrical Contractor”; all work indicated in specification divisions 26, 27, and/or 28; all work indicated in other specification division sections as being “by the Electrical Contractor”, and all “Electrical Contractor” scope identified or spelled out in specification Division 1 and the General Conditions.

B. Furnish all materials, labor, tools, transportation, incidentals, and appurtenances to complete in every detail and leave the renovated lab and office areas in working order, including all items of work called for herein and shown on the accompanying Drawings; including but not limited to; the new panel scheduled, the feeder coming to it, and the branch circuits feed by it; new circuit breakers indicated in the existing panels, and the feeders/branch circuits feed from them; power disconnect switches; lighting fixtures, lighting control devices (dimming type occupancy sensors, or as indicated/noted, reuse of existing lighting circuitry, with reconfigured controls as indicated; reuse of indicated power outlets; surface raceway; standard and special configuration power devices (in the floor, in the walls, in raceway, or as indicated); IT devices (in the floor, in the walls, in raceway, or as indicated); power pole work; new WAP’s; lab equipment connections (device and hard wired); mechanical equipment feeders and connections; and Fire Alarm work.

C. It is the intent that the ensuing work shall be complete in every respect and that any material or work not specifically mentioned or shown on the Drawings, but necessary to fully complete the work, shall be furnished.

1.02 COORDINATION OF PLANS AND SPECIFICATIONS

A. Contact the A/E immediately if there is any question regarding the meaning or intent of either the Plans or Specifications, or upon noticing any discrepancies or omissions in either the Plans or Specifications.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 SITE VISITATION

A. The Bidder is encouraged to visit the site and fully inform himself concerning all conditions affecting the scope of the work. Failure to visit the site shall not relieve him from any responsibility in the performance of this Contract.

3.02 SUPERVISION OF WORK

A. The Contractor shall have in charge of the work, at all times during construction, a competent superintendent with a large experience in the work to be done under this Specification.

B. Refer to the Specifications covering all branches of the work and keep fully informed of the progress of general construction. Install all work that is concealed and built into the building in sufficient time to insure proper location without delays to the work of the other trades. Properly attend to the work during the process of building-in to prevent misalignment and damage.

3.03 EXISTING WORK AND DEMOLITION

A. Suitably and adequately protect the existing work within, and immediately adjacent to, the new work areas from damage and injury during the process of installing the work under this Contract. Existing work that has been harmed, damaged or injured as a result of the Electrical Contractor's operations shall be repaired, restored or replaced at the Electrical Contractor's expense.

B. Revise existing wiring as indicated or required. Existing work that remains shall be left in first class condition, properly cleaned and reconnected.

C. Branch circuit wiring from removed fixtures and receptacles shall be removed back to the source unless noted otherwise.

D. Reuse existing concealed conduit and flush mounted boxes when possible. All installed but un-reused boxes shall be blanked-off. All new conduit and wire in remodeled areas shall be run concealed where possible.

3.04 CUTTING AND PATCHING

A. Avoid cutting of concrete, masonry and other work by using inserts and sleeves instead. When necessary, cutting shall be done by the Electrical Contractor with such tools and methods as to prevent unnecessary damage to surrounding areas or equipment.

B. Electrical Contractor shall give the General Contractor locations and sizes of all openings required for the installation of electrical equipment before walls, slab, etc., are started. If it becomes necessary to cut into new work because of the failure of this Contractor to notify the General Contractor, then the General

Contractor shall coordinate any necessary cutting by this Contractor. Patching shall be made by the appropriate trade contractor at this Contractor's expense.

C. No cutting shall be done which will in any way reduce the structural strength of the building. Should such cutting be found necessary, the A/E must first be fully informed of, and consent to, the proposed operation.

D. All cutting through poured concrete slabs and walls shall be done with core drills. No jackhammers will be allowed.

E. Patching shall match existing surfaces in type and finish and shall be done by the General Contractor at the Electrical Contractor’s expense. This includes patching existing ceilings and floors where required and patching holes left by removal of existing conduits, equipment, etc.

F. Repair of damages created by this Contractor to newly painted or refinished areas shall be done by the General Contractor at the Electrical Contractor’s expense in type and finish to match existing.

G. All conduits, equipment, etc. that penetrates walls or floors shall have openings, sleeves, etc. filled and closed off to prevent the possible spread of fire or products of combustion through the wall or floor.

H. Where required to maintain fire rating, openings shall be sealed utilizing Hilti or 3M Brand Fire Barrier Penetration Sealing systems. Fire barrier or fire stop systems from Crouse-Hinds, Thomas & Betts or Dow Corning may be used at Contractor's option. This includes holes left due to removal of existing conduit, etc.

3.05 CLEANING AND PAINTING

A. All electrical equipment shall be kept dry and clean during the construction period.

B. Interiors of all enclosures, panels, etc. shall be thoroughly vacuumed, cleaned and all dirt and debris removed before installing trim or covers.

C. All finished surfaces of equipment furnished under this Contract shall be thoroughly cleaned of dirt. All scratched or damaged surfaces shall be touched up with matching materials before final acceptance of the work. No exposed ferrous metal surfaces shall be left unpainted. Touch-up all galvanized surfaces, if scratched, with two coats of aluminum paint.

D. Prime and paint all steel hangers, boxes, straps, rods, etc. which are not provided with rust-protective finish or if the protective finish is damaged during installation. Paint is to be zinc chromate primer with aluminum bronze finish. This includes unfinished, mechanical and "exposed to view" locations.

E. When all work, furnished under this Contract is completed and has been satisfactorily tested and accepted by the A/E all fixtures, conduit and other exposed surfaces shall be thoroughly cleaned.

F. All lamps in all fixtures shall be installed new and the entire system shall be checked for satisfactory operation.

G. Dust must be held to a minimum when work is performed inside of the existing building.

3.06 EXCAVATION AND BACKFILL

A. Provide all excavation and backfill necessary to get the work in place. Such excavation shall be carried to the minimum dimensions and depths indicated, or as necessary for the proper installation and completion of the work.

B. Remove all formwork and debris before backfill is placed. Backfill shall is to be brought to the proper elevation and shall be puddled, tamped and thoroughly compacted.

C. Surplus soil removed from excavations shall be removed from the site by this Contractor unless the General Contractor requests that it be retained as future fill for rough grades.

D. All excavated areas shall be barricaded and properly protected.

E. Direct-buried conduits and cables shall have a compacted granular base and backfill to protect the buried services from sharp edges exposed during the original excavation.

END OF SECTION 26 00 20

SECTION 26 00 30

CODES AND FEES

PART 1 - GENERAL

1.01 CODES

A. All work performed under this Specification shall be done in accordance with the latest edition of the National Electrical Code as prepared and published by the National Fire Protection Association; Standards of National Bureau of Fire Underwriters; and any Federal, State or Local Codes that apply.

1.02 PERMITS AND FEES

A. Refer to the General Conditions, Article 2, for Contractor responsibilities regarding permits. The A/E will obtain the general building permit.

B. Submit fire alarm system shop drawings with the seal and signature of the manufacturer's qualified design professional to the A/E for review prior to submitting to the State for final plan approval.

C. The contractor shall schedule all inspections and pay associated inspection fees.

1.03 MODEL ENERGY CODE

A. All motors used in Mechanical Systems must comply with the requirements of the "Model Code for Energy Conservation".

B. All motors rated greater than 1000 watts shall have a power factor of not less than 85% under rated load conditions. Power factor of less than 85% shall be corrected to at least 90% under rated load conditions.

C. On all package equipment where starters are provided with the equipment such as chillers, air conditioners, etc., the manufacturer will be responsible for providing and installing power factor corrective devices to comply with this Code.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

Not Applicable

END OF SECTION

SECTION 26 01 20

OPERATION & MAINTENANCE MANUALS

PART 1 - GENERAL

1.01 OPERATION & MAINTENANCE MANUALS

A. Submit three (3) bound copies of operation and maintenance manuals, 8-1/2 inch by 11 inch in 3-ring hardback binder. 23 inch by 25 inch and larger sheets shall be folded and indexed in rear of binder.

B. Format:

1) The Title page shall include the Title of the Project, Name of The University, Address of the Project, Date of Submittals, Name and Address of Contractor, Name of A/E.
2) Second page shall be the Index for the manual contents.
3) The first section shall include a copy of each approved shop drawing and submittal with an index at the beginning of the section.
4) The second section shall include a list that is the same as the submittal drawings of all equipment used on the project. List shall include each supplier's name and address.
5) The third section shall include Operating and Maintenance Instructions. Manufacturer's maintenance manuals for equipment furnished under this Contract shall include such items as parts lists, procedures for performing normal maintenance functions, preliminary trouble shooting procedures and wiring diagrams.
6) The fourth section shall include complete wiring diagrams for the systems as actually wired including control and interlocking wiring.
7) Brief but complete instructions for start-up, shut-down, and routine maintenance of each system.
8) Contractor Certificate of Warranty
9) Test Reports and Certifications
10) Written receipt of spare parts
11) Inspection approval documents

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 PERSONNEL INSTRUCTION

A. After placing systems in operation, thoroughly instruct designated personnel on operation and maintenance of all equipment and systems.

B. Provide a minimum of four (4) hours of total instruction. Instructions shall include:

1) Location of equipment and explanation of function.
2) Clarification and explanation of operating and maintenance manuals.
3) Coordination of written and verbal instructions so personnel understand each.

C. The Electrical Contractor shall be responsible for arranging for the instruction and supervision at a time convenient to the University or his representative and for notifying the A/E of the time at least 48 hours in advance.

END OF SECTION

SECTION 26 01 26

TESTS AND INSPECTIONS

PART 1 - GENERAL

1.01 INSPECTIONS

A. Obtain all inspections required by all laws, ordinances, rules, regulations or public authority having jurisdiction. Obtain certificates of such inspections and submit these to the A/E. Pay all fees, charges and other expenses in connection with inspections.

B. Before any electrical work is covered, the A/E will inspect the electrical work completed at that time.

C. When the Contractor determines all work is completed and working properly per the Contract Documents, the Contractor shall request a "Final" inspection by the A/E in writing. If more than one re-inspection is required after this final inspection, the Contractor shall bear all additional costs, including compensation for the A/E's additional necessary services. A final inspection will not be made until Operating and Maintenance Manuals and Test Reports are submitted and approved and all prior "Observation report" punch lists are completed, signed and returned to the A/E.

1.02 OBSERVATION REPORTS

A. During the course of construction, the A/E will prepare "Observation Reports" with a list of items found to be in need of correction. The Contractor shall correct all items listed. A space is provided on the form for the Contractor to note the completion of each item. All prior "Observation Report" items must be completed and the lists signed and returned to the A/E prior to making the final inspection. After the final list is issued, the same procedure applies.

1.03 TESTS

A. When the A/E makes final inspection of all electrical work, he will order tests to be performed as deemed necessary. These tests may include operation of lights and equipment, continuity of conduit system, grounding and insulation resistances and various system operations. This Contractor shall provide such assistance as required, including manpower and tools, to perform these tests and simulate control sequences. The Contractor, not the A/E, is responsible to turn on the systems and demonstrate they are operating properly.

B. Submit data taken during such tests to the A/E. Pay all necessary professional fees involved in required testing of equipment.

C. All signaling systems, such as fire alarm, shall be checked out and tested by a qualified field representative of equipment vendor. A report shall be submitted to A/E by vendor representative indicating results of such final check out and test. Final payment will not be approved until such report is submitted.

D. If the A/E determines that any work requires special inspection, testing or approval which "Part 3: Execution" does not include, he will, upon written

authorization from the University, instruct the Contractor to order such special inspection, testing or approval. The Contractor shall give timely notice so the A/E may observe these inspections, tests or approvals. If such special inspection or testing reveals a failure of the work to comply with the requirements of the Contract Documents, the Contractor shall bear all costs thereof, including compensation for the A/E's additional services made necessary by such failure. Otherwise the University shall bear such costs, and an appropriate Change Order shall be issued.

1.04 UNACCEPTABLE WORK

A. Work shall be unacceptable when found to be defective or contrary to the Plans, Specifications or Codes specified, or accepted standards of good workmanship.

B. The Contractor shall promptly correct all work found unacceptable by the A/E whether observed before or after substantial completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such unacceptable work, including compensation for the A/E's additional services made necessary thereby.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.01 PHASE ROTATION

A. Prove that all electrical equipment is connected for clockwise rotation (A-B-C).

3.02 RESISTANCE AND CONTINUITY

A. Provide insulation and grounding resistance and ground continuity tests of feeders, branch circuits, or equipment on demand.

3.03 CONNECTIONS

A. Prove that mechanical connections are torqued to manufacturer's recommended UL and NEMA standards on demand.

3.04 EQUIPMENT

A. Provide necessary electrical personnel and testing instruments as required to assist in installation testing.

END OF SECTION

SECTION 26 05 19

WIRE AND CABLE

PART 1 - GENERAL

1.01 SCOPE

A. Furnish and install all wiring required to connect complete power, lighting, and grounding.

PART 2 - PRODUCTS

2.01 STANDARDS

A. All conductors shall be 98 percent conductivity copper unless use is restricted by government agencies, NO. 12 AWG and smaller may be solid. No. 10 and larger shall be stranded, and of the AWG size and type shown on the Drawings. Where no size or type is shown, conductors shall not be less than #12 type XHHW, THHN or THWN. All conductors shall have 600 volt insulation, be UL listed and of an American manufacturer.

B. All conductors shall be stranded unless otherwise noted and conform to the latest edition of the Underwriters' Laboratories, Inc., "Standard for Thermoplastic-Insulated Wires and Cables" and the National Electrical Code.

C. No wire used for lighting or power shall be smaller than #12 AWG.

D. No wire used for control circuits shall be smaller than #14 AWG.

E. Stranded #14 AWG copper or #14 solid two conductor cable shall be the minimum used for fire protective signaling circuits.

F. Each branch circuit requiring a neutral shall be furnished with a separate individual neutral conductor.

G. All wiring not concealed in conduit shall be plenum rated. Refer to Division 27 and Division 28 specifications for additional wiring requirements.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All conductors shall be continuous from box-to-box. No joints shall be permitted in the circuit other than in junction boxes or fixtures.

B. All make up connections to fluorescent lighting fixtures and all branch circuit conductors run in wiring channels of fluorescent lighting fixtures shall be THHN, THHW, or XHHW rated 90°C.

C. Equipment ground conductors shall be of the same insulation type as the associated circuit conductors.

D. All conductors of a circuit shall follow the same path through any openings in metal partitions within the enclosure.

E. The ampacity of all conductors shall be at least as great as the rating of the fuse or circuit breaker on the line side of the conductors. Note the ampacity reduction required by Code when more than three conductors are placed in a raceway.

1. All conductors for distribution and control equipment terminations shall be based on full 75°C ampacity.

2. All conductors for appliance and utilization equipment terminations rated 100 amperes or less shall be based on 60°C ampacity.

F. Provide cable supports for vertical raceways per NEC Table 300.19 (A).

G. Wiring shall be installed in separate conduits for the following systems:

1. All emergency and exit lighting.
2. Control wiring.
3. Auxiliary systems wiring.
4. Fire alarm system wiring.

H. Swab conduits free of moisture, dirt and grease before pulling wire. Care shall be exercised while installing wire in conduits so that conductor insulation will not be injured. No oils, grease or compounds other than Ideal "Wire Lube", "Yellow 77" or equal UL approved wire-pulling lubricants shall be used for pulling any conductors.

I. Remove all wire cut dead.

3.02 CONNECTIONS

A. All connections are to be made using pressure type terminals.

B. Where connections are to be made to devices or equipment under screw heads only, install insulated, crimp-type spade clips on the wire ends before the connections are made.

C. Devices shall not be used as through connection points. Where through circuits are involved, they shall be spliced in the box with a pigtail connected to the device.

D. Connectors shall contain only one wire unless they are listed for multiple conductors.

E. Joints in #10 and smaller wire shall be made using the following types of connectors: Minnesota Mining and Manufacturing "Scotch Lok", Ideal Industries, Inc. "Wing Nut", or Thomas and Betts Co. Type "PT". Connectors shall be used only within their range. Other threaded-on types of insulated connectors shall not be used.

F. Joints in #8 and larger wire or joints in any wires above the range of threaded-on connectors shall be made using pressure type mechanical connectors applied after wires are cleaned and then insulated using two (2) layers of "Scotchfil" brand electrical insulation putty and covered by two (2) half- lapped layers of "Scotch 88", or Plymouth Slipnot Gray vinyl plastic electrical tape. Connectors can be installed and sealed against moisture by installing Raychem "TCS (indoor) or WCSM (exterior)" sealant coated heat shrink tubing.

G. Connections in No. 10 and smaller wire shall be made with threaded-on plastic or nylon insulated wire nuts. Crimp connectors, except butt connectors, are prohibited.

3.03 WIRE COLOR CODE

A. The following color code shall be used:

	120/208 Volt	277/480/ Volt
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Gray
Equipment Ground	Green	Green w/ Yellow Stripe

All control circuits shall be pink.

B. Conductors #10 AWG or smaller shall have insulation colored as noted above.

C. Conductors No. 8 or larger shall have insulation colored as noted above or colored tape, minimum size ½" wrapped twice around at the following points:

1) At each terminal
2) At each conduit entrance
3) At intervals not more than 12 inches apart in all boxes, panel tubs, switchboards, etc.

D. Equipment grounding conductors #8 AWG and larger shall be green or have green tape applied in a continuous wrap where visible at panels, junction boxes, etc.

3.04 MARKING

A. All branch circuits shall be marked in the panelboard gutters. Markers shall indicate corresponding branch-circuit numbers.

B. All signal and control wires shall be marked at all termination points such as cabinets, terminal boxes, equipment racks, control panels, consoles, etc.

C. Wire markers shall be Thomas and Betts vinyl tape type WM wrapped once around the wire with the adhesive sides placed together to form a flag.

D. Wire markers shall be installed when wire is pulled.

3.05 EXIT AND EMERGENCY WIRING

A. All exit and emergency wiring shall be as shown on the Drawings and shall be run in a separate conduit from any other wiring. Branch circuit wiring shall be #10 THHN minimum.

B. Wire insulation shall be color coded the same as the respective voltage building wiring, and be identified with 1/2" wide red tape wrapped twice around at not more than 12" intervals at all access points. On conductors #8 AWG and larger with black insulation, red tape will be used in addition to other identification tape.

END OF SECTION

SECTION 26 05 23

MOTOR AND EQUIPMENT WIRING

PART 1 GENERAL

1.01 SCOPE

A. Provide power and connect all motors and motor driven equipment shown on the Plans.

B. Furnish, install and connect all over current and disconnect means as required by the National Electrical Code.

C. Motors and motor driven equipment shall be provided and installed by others. Motor controllers and control devices shall be furnished and installed by the Electrical Contractor except for temperature control equipment and devices and starters for controllers furnished as part of packaged equipment, except as otherwise noted.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.01 INSTALLATION

A. Install and wire all motor control equipment per wiring diagrams and instructions, including interlock wiring between equipment.

B. Motor and equipment locations shown on the Drawings are approximate. Obtain exact locations from the Contractor concerned.

C. All temperature control conduit and wiring shall be furnished by the Temperature Control Contractor except line voltage thermostats shall be furnished by the Temperature Control Contractor and installed and wired by the Electrical Contractor. Items furnished by the Temperature Control Contractor and shown in the wiring diagrams, or noted on the Electrical Drawings, shall be wired by the Electrical Contractor.

D. Refer to the Mechanical, Plumbing, and Fire Protection Specifications for description of electrical equipment and controls furnished by them.

E. Verify all control sequences, etc. in accordance with Section 26 01 26, "Tests and Inspections".

END OF SECTION 26 05 23

SECTION 26 05 26

GROUNDING

PART 1 - GENERAL

1.01 SCOPE

A. All branch circuits over 100 volts shall include a Grounding Conductor sized in accordance with NEC Table 250.122, except not be smaller than #12 for power and lighting circuits and #14 for control circuits. All ground conductors shall be Green, or as specified under Section 26 05 19, "WIRE AND CABLE".

B. All feeders shall include a Grounding Conductor sized in accordance with NEC Table 250.122, except not be smaller than #12 for power and lighting circuits and #14 for control circuits. All ground conductors shall be Green, or as specified under Section 26 05 19, "WIRE AND CABLE".

PART 2 - PRODUCTS

2.01 GENERAL

A. All ground clamps shall be Penn-Union "GPL" type or similar by O.Z. or Burndy.

B. Conduit grounding type bushing shall be T & B Series 3870 with appropriate size ground wire terminal.

C. Enclosures, junction and pull boxes shall utilize a "panel" type ground bar or U.L. listed grounding lugs or screws, as the number of ground conductors dictates.

PART 3 EXECUTION

3.01 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and circuits.

C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.

5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.

D. All conduits entering switchboards and substations shall be bonded together with # 3/0 AWG wire connected to a conduit grounding bushing. These shall then be bonded to the ground bus in the equipment item.

3.02 INSTALLATION

A. All enclosures, boxes, fixtures, etc., shall be grounded by being securely bonded to the grounding conductor. Boxes, conduit, etc., shall not be used as part of the grounding "conductor" system.

B. Enclosures not requiring a ground bar shall have all ground conductors connected together and a pigtail the size of the largest conductor bonded to the enclosure with a single ground connector used for no other purpose.

C. At each receptacle box, the ground conductor shall enter and connect, with normal wiring connector, to: 1) The ground pigtail to receptacle; 2) The ground pigtail to box ground screw; and 3) The outgoing ground conductor to next device, if not at end of run. Metal to metal contact between the device yoke and the outlet box is not acceptable as a bond for either surface mounted boxes or flush type boxes.

D. Motor terminal boxes shall be grounded by the use of manufacturer-supplied ground lug or by drilling and tapping a hole for a ground screw. Remove paint prior to making the connection.

E. Lighting fixtures shall be grounded by the use of a manufacturer-supplied ground lug or pigtail or by the use of ground clips fastened on bare metal that is free of paint.

F. Conduit system shall be electrically continuous. All locknuts shall cut through enameled or painted surfaces on enclosures. Where enclosures and non-current carrying metals are isolated from the conduit system, use bonding jumpers with approved clamps. Where reducing washers are used and where concentric or eccentric knockouts are not completely removed bonding bushings shall be required.

3.03 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.

2. Make connections with clean, bare metal at points of contact.

3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.

4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.

5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with grounding screw and pressure-type connectors.

C. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

D. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

E. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

F. Nameplates: Provide engraved plastic nameplate at ground buses.

END OF SECTION

SECTION 26 05 33

CONDUITS

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install all conduits, boxes, fittings, etc. for a complete raceway system.

B. See Division 26 Section, "Boxes and Plates".

PART 2 PRODUCTS

2.01 CONDUIT - Electrical Metallic Tubing (EMT)

A. All wiring in building interior including feeders, branch circuits and auxiliary wiring shall be run in thin wall (EMT) conduit.

B. All steel conduits shall be galvanized and have the manufacturer's name and U.L. label attached to or stamped on each piece.

C. Each section of conduit shall be straight, free from blisters and other defects and in 10'-0" lengths. Galvanizing shall be of such nature and so applied that it will not crack or flake when conduit is bent.

D. All conduit sizes stated in Specifications or marked on the Drawings are minimum size and shall be no less than ¾", unless otherwise noted.

2.02 CONDUIT - Rigid Metallic (RMC)

A. All steel conduits shall be galvanized and have the manufacturer's name and U.L. label attached to or stamped on each piece.

B. Each section of conduit shall be straight, free from blisters and other defects and in 10'-0" lengths.

2.03 CONDUIT - Flexible Metallic (FMC & LFMC)

A. Lighting fixtures may be supplied with short lengths of flexible metallic conduit (FMC) with green ground wire.

B. Flexible galvanized steel conduit with PVC jacket (LFMC) shall be used for "make-up" connections to rotating machinery and heating elements.

C. Minimum size shall be ½" trade size. This size is only acceptable for lighting fixture whips.

2.04 CONDUIT FITTINGS - Metallic

A. All thinwall connectors shall be of the compression insulated-throat type, similar to Thomas and Betts No. TC-722 (¾"). All fittings shall be steel. No die cast fittings will be allowed. Contractor may use Thomas and Betts, Raco, Steel City or Midwest fittings.

B. Compression fittings shall be used exposed below 8 feet from finished floors. Set Screw type fittings may be used in all other applications. Setscrew fittings may be used below 8 feet if the bolts are not pointing outwards.

C. All rigid and IMC conduits shall have threaded connections.

D. Liquid-tight flexible metallic fittings shall be Midwest LTB-50. Flexible metallic fittings shall be Steel City XC-242.

E. "Mineralac" type supports and "Unistrut" type one bolt supports with square ends shall not be used at any location.

PART 3 EXECUTION

3.01 INSTALLATION

A. All rigid (RMC) or intermediate (IMC) conduit entering cabinets, pull boxes, junction boxes or outlet boxes shall be secured with double lock nuts and bushed ends.

B. No more than four (4) 90° bends will be allowed in any one conduit run. Where more bends are necessary in any single run, a pull box shall be installed. Pull boxes shall also be installed in long runs at a maximum separation of 100'-0". All conduit shall be routed parallel or perpendicular to the lines of the building. No out of plumb or diagonal lines will be accepted.

C. Unless otherwise noted, all conduits shall be run concealed within the building construction when installed in finished interior. Conduit in equipment rooms and may be run exposed.

D. All conduits shall be substantially supported by pipe straps, suitable clamps or hangers that are attached to the elements of the building structure to provide rigid installation. In no case shall conduit be attached to or supported from adjoining pipe, or installed in such a manner as to prevent the ready removal of other pipe for repairs.

E. Thomas and Betts "Ty-Rap" self-locking ties may be used to support conduits up to 1" which are running horizontally on top of small structural members or through bar joist.

F. Strap iron hangers and wire will not be approved as means of conduit support.

G. No conduit shall rest on or be supported from acoustical tile ceilings or the ceiling tile suspension system.

H. Where conduit runs across building expansion joints or where necessary to compensate for thermal expansion or contraction, expansion unions with grounding continuity shall be provided.

I. Exercise necessary precautions to prevent accumulation of water, dirt or concrete in conduits during execution of electrical work. Conduit in which water or foreign material has been permitted to accumulate shall be thoroughly cleaned or replaced where such accumulations cannot be removed.

J. All conduits must be kept dry and free of water or debris with approved pipe plugs or caps.

K. Flexible conduit may only be used as follows:

1. Lighting fixtures may be supplied with short lengths not longer than 6'-0".

2. Movable partition spaces may be supplied with any length.

3. Make-up connections to transformers may be supplied with lengths not longer than 2'-0".

4. All expansion joints, flexible connections and vibration isolators shall be bridged with short lengths not longer than 2'-0".

L. All connections to rotating machinery and heating elements shall be made with short lengths of liquid-tite conduit. Where motors are mounted on sliding bases, the flexible connection shall be long enough to allow full travel of the motor on the base, maximum 36".

M. Pull Wires

1. A pull wire shall be installed in all empty conduits. In dry locations, pull wire shall be #14 gauge galvanized steel or nylon pull cord.

2. Both ends of all pull wires shall be identified by means of labels or tags, reading "PULL WIRE" and shall be numbered to refer to the same pull wire.

N. For remodeling and renovation projects, remove all conduits cut dead except where in concrete or masonry.

O. Conduit Installed through a building wall shall have internal and external seals. Link-seal or equivalent.

END OF SECTION

SECTION 26 05 34

BOXES AND PLATES

PART 1 GENERAL

1.01 SCOPE

A. Furnish and install all outlet, junction, and pullboxes as indicated on the Drawings and as necessary to install the required conduit and wiring in a neat and workmanlike manner.

B. Furnish and install all outlet and junction box covers and wiring device plates. Refer to Division 27 Drawings and Specifications for communication device cover plates.

PART 2 PRODUCTS

2.01 STANDARDS

A. Pullboxes, outlet boxes, and junction boxes shall be in accordance with Code requirements and shall be Underwriters' Laboratories labeled.

2.02 BOXES FOR FLUSH WORK

A. Flush outlet, junction and pullboxes shall be pressed steel galvanized or sherardized and shall be a minimum of 4" square or octagonal similar to Appleton #40. Steel boxes cast in concrete shall be designed for concrete installation.

B. Flush wall boxes in brick or other finished masonry walls shall be Steel City GW-135-NG Series, or Raco 695 Series.

2.03 BOXES FOR EXPOSED WORK

A. All boxes for exposed work in finished spaces shall be "FS" type with threaded hubs and rigid conduit riser.

B. All boxes for exposed work in unfinished spaces shall be steel 4” square.

2.04 PLATES AND COVERS

A. Switch and receptacle plates shall be #302 stainless steel or die cast aluminum.

B. All device plates in cleanroom spaces on flush and cast boxes shall be weatherproof style with neoprene gaskets to mitigate air leaks, per specification section 26 27 26.

C. Plates for exposed outlets in unfinished spaces (outside of cleanroom) shall have Steel City Series RS-4" square galvanized surface covers for application required. Covers shall be raised 1/2" and edges fit flush with top of box.

D. Special or engraved plates, as indicated on the Drawings, shall be P&S #302 satin stainless steel or cast aluminum for the application required. Letters shall be 3/16" high, engraved with black enamel fill.

E. Blank outlets where required in finished areas shall match wiring device covers in that area.

F. Plates as manufactured by Hubbell, Cooper, Pass & Seymour/Legrand, or Leviton, may be furnished at this Contractor's option.

G. Where multiple switches are shown, gang under 1 common wall plate.

PART 3 EXECUTION

3.01 INSTALLATION

A. All boxes shall be rigidly supported from building structure independent of the conduit system. Boxes cast into masonry or concrete are considered to be rigidly supported.

B. Close all unused and open knockouts with plugs of the proper size.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION

PART 1 - GENERAL

1.01 SCOPE

A. All individual switches, disconnects, starters, power and lighting panels, cabinets and pull boxes for auxiliary systems (such as telecommunications, fire alarm system and emergency exit lights, etc.), shall be identified on the front cover or trim with its name and/or designation number or letter as shown on the Drawings and with the voltage available within the panel.

B. Provide arc flash hazard warning label on electrical equipment (distribution panels, panels, etc.)

PART 2 - PRODUCTS

2.01 GENERAL

A. Identification shall be in the form of laminated plastic nameplates with black face and minimum ¼" high letters engraved into a white background. Plates shall be drilled on each end for sheet metal screw attachment. No "Dymo" or similar tape-type labels will be allowed.

B. Fire Alarm System and Life Safety/Standby equipment nameplates shall be red face with minimum ¼" high letters engraved into a white background.

C. The following are examples of the nameplate layout and wording:

Panel N1
208/120 volt, 3 phase, 4-wire
Fed From: "UNIT SUBSTATION"

Pump P-1
5HP, 208 volt, 3 phase
Fed From: "PANEL M"

PART 3 - EXECUTION

3.01 INSTALLATION

A. Plastic nameplates shall be attached to face of electrical device by sheet metal screws. Locate plate so wording reads horizontally and plate does not obstruct other identification plates, latches or operators.

B. Fire Alarm/Emergency boxes and enclosures shall be painted red and have appropriate system identification nameplate.

C. Install nameplate at power receptacles where the nominal voltage between any pair of contacts is greater than 150 volts, if manufacturer does not display this data on front of device.

D. Per NEC section 210.5(C), a phase color-code nameplate shall be mounted on the inside trim of the branch-circuit panelboards, adjacent to the manufacturer's nameplate. Refer to Specification section 26 05 19, “Wire and Cable” for proper color code for voltage utilized.

E. All junction, outlet, and switch boxes shall have black permanent marker identification on the interior listing the circuit(s) contained within each box.

F. Provided updated, typewritten panel schedules for all new and existing panelboards from which circuits are added, removed, or altered. Handwritten schedules are not acceptable. Existing panels with circuits removed shall list circuit breaker as "spare". Include area/room numbers for all circuits. Use final room numbers to match room signage. For existing panelboards where new work is being performed, update and print the typed panel schedule circuit index. Obtain proper Excel format panel schedule circuit index from FOD Engineering. Electrical contractor to update excel spreadsheet panel schedules and submit to FOD Engineering at project completion.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.01 SCOPE

A. Furnish and install all wiring devices where shown on the Drawings.

B. Wiring devices shall be furnished in strict accordance with the catalog numbers and manufacturers listed in the Schedule that follows. Other special purpose devices shall be provided as specified on the Drawings.

PART 2 - PRODUCTS

2.01 STANDARDS

A. Duplex Grounding Type Receptacle - 20 amp, 125 volt - NEMA 5-20R

Hubbell - HBL5352

B. Single Pole Switches - 20 amp, 120/277 volt

Hubbell - HBL1221

C. Single Pole Switches with Pilot Light - 20 amp, 120/277 volt, Red light on with load on

Hubbell - HBL1221-PL

D. Digital wall timer - 20 amp, 120/277 volt, 5 min to 12 hour

Wattstopper - TS-400

E. G.F.I. Receptacle - 20 Amp, 125 Volt - NEMA 5-20R

Hubbell - GFR5362SG with S26

F. Hospital Grade receptacles shall be used in all patient care areas.

2.02 APPROVED MANUFACTURERS

A. The Electrical Contractor may at his option furnish equal devices by Cooper, Pass & Seymour/Legrand, or Leviton, and equal device covers by Slater, Leviton, or Hubbell.

2.03 FINISHES

A. Wiring devices connected to normal power shall be white unless otherwise indicated or required by NEC.

B. Wiring devices connected to emergency power shall be red unless otherwise indicated or required by NEC.

C. All cover plates shall be stainless steel or die-cast aluminum.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install wiring devices in a neat and workmanlike manner.

B. Ground all receptacles in accordance with Article 250.146 of NEC and as indicated in the Grounding Section of this Specification.

C. To eliminate noise pass through, outlets or devices shall not be mounted back to back.

D. Wiring devices specified are side and back wired type and shall be back wired.

E. General use duplex receptacles shall be grounding type, 20 ampere, and 125 volt.

F. Set digital wall timer for 2 hour duration.

END OF SECTION

SECTION 26 28 16

DISCONNECT SWITCHES

PART 1 GENERAL

1.01 SCOPE

A. Provide heavy duty fusible or non-fusible disconnect switches where shown on the Drawings, in conformance with NEC requirements for each unit of equipment.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Square D, ABB, or Cutler Hammer disconnect switches may be furnished at this contractor's option.

B. Switches shall be wall mounted in NEMA 1 enclosure unless otherwise noted. They shall be NEMA heavy-duty type and shall have the rating, capacity and number of poles for the service concerned.

C. Switches in exterior locations shall be NEMA 3R, unless otherwise noted.

D. Switch handle shall be pad lockable.

E. Fusible switches shall have Class R fuse clips.

F. Switches for use on motor circuits shall be horsepower rated.

PART 3 EXECUTION

3.01 INSTALLATION

A. Switches shall be installed to provide Code required clearance and shall be generally wall mounted with top at 6'-0".

B. Disconnects mounted on equipment shall be field coordinated and located to clear any access openings or paths.

C. Provide free standing Unistrut support frame for switches that cannot be wall or equipment mounted. Frame shall be full height and attached at the floor and ceiling, and angle braced to floor or poured into concrete equipment pad to provide rigid structure. Minimum height to top of floor-mounted switches shall be 3'-0".

D. Switches shall have identification plates in accordance with Specification Section 26 05 53, “Identification”.

END OF SECTION 26 28 16

SECTION 26 51 13

LIGHTING FIXTURES

PART 1 - GENERAL

1.01 SCOPE

A. Contractor shal furnish and install lighting fixtures as indicated in the Fixture Schedule shown on the Drawings and Specified herein.

B. All lighting fixtures are indicated on the Drawings with an identifying letter and number, i.e., S1, CL2, R5, etc. Refer to the Fixture Schedule on the Drawings, which identifies the fixture in accordance with these letters and numbers and indicates the type of mounting of the fixture in accordance with the Legend Section of the Schedule.

C. Coordinate to provide lighting control / occupancy sensors, that are compatable with the LED lighting fixtures, and drivers, being provided.

PART 2 - PRODUCTS

2.01 STANDARDS

A. Lighting fixtures scheduled on the Drawings are specified as standards for design, quality and appearance. The A/E will consider fixtures of other manufacturers provided they are equal to or better than the standard. Refer to Specification Section 26 00 10, “General Provisions.”

B. Fixture materials given with the standard fixtures shall be maintained if alternate manufacturers are used, i.e., metal sides for metal sides, acrylic plastic louvers for acrylic plastic louvers, etc.

2.02 GENERAL

A. Lay-in grid fixtures may be furnished clips for use in supporting fixtures in accordance with NEC Article 410.36(B).

B. Flush fixtures may be furnished with prewired feature provided they are UL approved for 75°C. wiring and the junction box capacity is sufficient for the circuit wiring requirements.

C. Clearances for recessed portions of fixtures from combustible material and thermal insulation shall be in accordance with NEC Article 410.116.

2.03 DRIVER

A. All LED fixtures shall have integral 0-10V dimming driver standard, 120-277V power supplies, and shall be U.L. approved. Color temperature shall be be noted on the light fixture schedule with 80 CRI minimum. Fixture shall be fully serviceable with upgradeable LED light engine, rated for 50,000 hour life, and be covered by a 5-year warranty. Provide delivered lumens as noted in the fixture schedule. Provide spare parts for each type LED fixture.

PART 3 - EXECUTION

3.01 GENERAL

A. This Contractor shall inform the General Contractor of location and framing details necessary for the installation of flush ceiling fixtures and deliver to the General Contractor all frames of these fixtures so that they become a part of the ceiling construction. This Contractor shall verify the actual suspension system to be used and make all adjustments in fixture installation provisions required thereby.

B. Flush fixtures that have light leaks between the frame and ceiling shall have a gasket installed by this Contractor between the trim and the ceiling.

C. Furnish all mounting straps, frames, rings and other accessories required for a complete lighting installation. Refer to architectural room treatment schedule. Should any conflict occur with the building structure that will not allow proper installation of fixtures, the A/E shall be contacted before proceeding.

D. No fixtures shall be installed until painting is completed. Fixtures with paint marks on them shall be replaced.

E. All light fixtures shall be installed with centerlines symmetrical to the building, or at angles so designated by the plans. Fixtures not set thus shall be removed and reinstalled at this Contractor’s expense.

F. Any fixtures scratched, bent, cracked or in any way damaged before acceptance by The University shall be replaced at this Contractor's expense.

G. All lighting fixtures are to be grounded on the interior of the fixture housing, on clean bare metal that is free of paint, by use of a pigtail and fastened by a screw used for no other purpose.

3.02 INSTALLATION

A. Wherever lighting systems are supported and fastened to a ceiling suspension system of the grid type, the following method shall be followed:

1) On suspended fixtures, an additional wire is to be added at each stem location from the structural floor above, providing there are no wires within 6" of the stem clip. NOTE: these wires cannot be suspended from the lathe and plaster but must be anchored into the structural floor.

2) The grid system shall have a support wire at each corner of each recessed fixture. Each fixture shall be fastened to the grid system in accordance with NEC Article 410.36(B) using suitable clips.

3) Flush fixtures in ceilings of the suspended lay-in type shall be installed so that the long dimension of the fixture is supported on the main support members of the ceiling system. All flush fixtures for lay-in ceilings shall be equipped with at least two galvanized steel safety support wires, or chains, attached from the fixture housing to the structure independent of the ceiling system. Wire or chain shall withstand a 50-pound drop test.

4) If fixtures are located other than on a main T-bar, additional T-bar or channel shall be added above the ceiling and fixture supported as directed, or fixture shall be supported independent of the ceiling suspension system.

5) The T-bar shall not be cut out to provide room for the junction box.

6) A few of the first fixtures shall be checked as soon as they are suspended, to determine if any sagging or twisting of the ceiling system exists, and if fixtures are firm and hang straight.

7) After all fixtures and lamps have been installed, the ceiling shall be rechecked for sagging, and any correction shall be the responsibility of the Electrical Contractor.

END OF SECTION

SECTION 27 05 28

CONDUITS AND BOXES FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 SCOPE

A. Furnish and install complete conduit system, junction boxes and conduit as shown on the Drawings and specified herein.

B. Coordinate the routing, extending to the system rack, with the low voltage supplier, providing systems cabling and devicing – as indicated on the drawings, and in Specification Section 27 15 00, Voice and Data Wiring Systems.

PART 2 - PRODUCTS

2.01 STANDARDS

A. Conduit drops for wall outlets shall be minimum of 1".

B. Technology outlet boxes shall be a minimum of 4-11/16" x 4-11/16” x 2-1/8” deep with a 2 gang cover/plaster ring when installed with conduit. See Specification Section 26 05 33, "Raceways and Boxes".

PART 3 - EXECUTION

3.01 INSTALLATION

A. No more than two (2) 90-degree bends in conduit without a pull box or slip sleeve. LB type fittings shall not be used in lieu of conduit bends.

B. Bends in conduits, and in particular conduits larger than 2", shall be long sweep bends.

C. Conduit system shall be continuous from all outlets to above lay-in ceiling. If the room has a solid ceiling, the conduit from the outlets shall be stubbed out into the nearest corridor. Where not in conduit, cables shall be secured in cable tray or other approved hanger assembly at intervals of 48 inches. Bundles must not exceed neither the cable nor hanger manufacturers' recommendations.

D. For conduit two (2) inches in diameter and smaller the recommended 90-degree bend radius is six (6) times the internal diameter.

E. Approved UL fire stop must be used when penetrating fire rated walls or floors.

F. Penetrations

1. Facilities Engineering must approve any core drilling for cable pathways that must run through solid (cement, etc.) walls, floor, or ceiling.

2. Installer furnishes and installs proper sealant at all conduits entering cleanroom spaces.

3. Installer furnishes and installs fire stop and sleeves for firewall penetrations as required by NEC code and in accordance with ANSI/EIA/TIA-569, Annex A (normative) Firestopping.

4. Installer seals all unused openings created for the job.

5. Sealing material and application of sealing material to comply with local fire and building authorities requirements.

END OF SECTION

SECTION 27 15 00

VOICE AND DATA WIRING SYSTEMS

PART 1 - GENERAL

1.01 SCOPE

A. Furnish and install all cables, cable supports, wall plates, connectors, line cords, patch cords, adapters, outlets, boxes, brackets, connector blocks, and all other accessories and parts required for a complete system.

B. Types of cable systems, specified in this section include the following:

1. Telephone/Voice Communication Cable Systems
2. Data Communication Cable System

C. It shall be the responsibility of the bidder to confirm all design reference part numbers, listed herein, as current and suitable for the items described and specified and shall file a formal RFI for all perceived discrepancies prior to bidding.

1.02 STANDARDS

A. All equipment shall meet the applicable requirements of UL and shielding requirements of the Federal Communications Commission.

B. Wire and cable shall meet the applicable requirements of NEC Articles 770 and 800, NFPA 72, NFPA 101, NEMA and IEEE.

C. Comply with applicable portions of NEMA-250 standards (et. al.) pertaining to grounding of electrical and/or communication equipment and enclosures.

D. Comply with EIA/TIA-568, 568A, 569, 607 and TSB 75 standards for commercial building wiring for voice and data communications as applicable.

E. Eligible equipment manufacturers and installers shall be those regularly engaged in the manufacture and installation of telephone/voice and data communication cabling system of the types and as specified herein and on the Drawings, whose products have been satisfactory used and installed in similar service for not less than five years.

F. Cable, wire, and outlet installation shall be performed by personnel that have been certified by an organization such as BICSI (Building Industry Consulting Service International) or shall have at least five years of successful installation experience with projects utilizing intrabuilding telephone/voice and data communication cabling system work similar to that required for this project. Contractor shall be certified by the manufacturer of the system to be installed and

provide a manufacturer's warranty. Contractor shall have on staff a full-time RCDD listed with the company on the BICSI website.

G. The A/E and OTDI reserve the right to disqualify manufacturers, equipment suppliers, and installers, who, in their sole opinions, do not comply with the requirements of these specifications.

H. The OTDI University Wiring Standard, most recent edition, shall take precedence in any dispute involving Data/Voice structured cabling materials and installation practices.

1.03 SUBMITTALS

A. For Review:
1. A minimum of five (5) reference accounts at which similar work, both in scope and design, have been completed by the Contractor within the last five (5) years.
2. Product data sheets of all components must be sent to OTDI for approval before material is purchased.
3. As-built riser/wiring diagrams and plans of the communication wiring system 3showing all cable runs, outlet locations, distribution frame layouts, connector block locations, etc. shall be submitted upon completion of the project. All documentation must be sent to OTDI prior to Life Safety Inspection. The bid documents will be available in AutoCAD format for use in developing the as-built drawings.
4. Product data sheets of test equipment.
5. System certification and warranty statement.
6. Completed materials list with quantities stated. Attached spreadsheet shall be submitted with proposal.

B. To be included in Record and Information Manuals:
1. One copy of each approved submittal
2. Cable test reports
3. Record drawings of the actual installation of the telephone/voice and data communication wiring system

1.04 MANUFACTURERS

A. Horizontal User Voice and Data Cables
1. Hubbell
2. OTDI Approved Equal

B. Connector blocks
1. Hubbell
2. OTDI Approved Equal

C. Voice/Data Outlets
1. Hubbell
2. OTDI Approved Equal

1.05 COMMUNICATIONS CABLING SYSTEM OVERVIEW

A The cable system shall be a single star topology for the horizontal cable distribution as defined by ANSI/EIA/TIA-568-A.

B. The installation shall be a certified system with supporting test results and a cable management system for tracking moves, additions and changes. The system shall meet ANSI/EIA/TIA cabling standards to ensure a flexible system that will support mutli-vendor operating systems.

C. All copper voice station cables shall originate from the wall field in the room indicated on the plans.

D. All copper data station cables shall originate from the 48-port patch panels in the room indicated on the plans.

E. Data station cables shall terminate in the 110-style connectors on the rear of the 48-port patch panels.

F. All fire rated wall and floor penetrations shall be fire-stopped with appropriate materials to maintain the integrity of the rating.

G. Horizontal user voice and data cable shall be four (4) twisted pairs UTP, 24 AWG solid copper conductors, 100 Ohm, color coded per the band strip color coding conventional standard as follows:

Pair #1 – White/blue and blue/white
Pair #2 – White/orange and orange/white
Pair #3 – White/green and green/white
Pair #4 – White/brown and brown/white

Cable shall be performance rated Category 6, as noted herein.

H. All components of the structured cabling system shall be Component Certified to meet the appropriate category of cabling being installed. The manufacturer shall provide Category 6 component compliance certificates from a recognized third party testing organization upon request. All jacks, faceplates, patch panels, and patch cords shall be of one manufacturer and supplied by the contractor. At no time are “modular plugs” for terminations acceptable.

I. Manufacturer’s Instructions

1. Compliance: Require compliance with instructions in full detail, including each step in sequence.
2. Conflict: In cases where the manufacturer’s instructions conflict with the Construction Documents, the contractor shall request clarification from the Manufacturer, OTDI and the design A/E before proceeding. OTDI and the design A/E’s permission to proceed is required in cases of conflict.

J. Furnish and install all patch cords from the 48-port patch panels to The OTDI active network equipment to provide for a complete and working system.

1. Furnish and install three foot, yellow patch cords in the closet in a quantity corresponding to 100% of the data jacks used on the project.

2. Furnish and install (1) one foot and (1) ten foot, grey patch cords on the user end corresponding to 100% of the data jacks used on the project as described below.
3. All patch cords to be installed by “OTDI Telecommunications and Networking”.
4. All patch cords must be tested for functionality.
5. For each work area outlet provide one 1’ and one 10’ CAT 6 patch cord of the same manufacturer and level of the structured cabling system. Basis for design: Hubbell #HC6xx01 and #HC6xx10.

PART 2 - PRODUCTS

2.01 MODULAR COPPER JACKS AND CONNECTORS FOR VOICE/DATA

A. Flush mounted modular RJ-45 Jacks to fit in a double gang, 3-1/2 inch deep box and/or fit in optional surface mounted wiremold as shown on drawings.

B. RJ-45 Modular Jacks shall be 110 style 8-position universal configurations and shall meet at minimum, the transmission performance requirements of Category 6. Punch down cable pairs at all termination points for 568A terminations.

C. RJ-45 Modular Jacks shall be UL listed and meet ANSI/TIA/EIA-568-B.2 requirements.

D. RJ-45 Modular Jacks shall be mounted in Modular Faceplates for six openings.

E. All Category 6 Outlet “Data” modules shall be black in color where connected to building IDF #014. Modules should be green in color where connected to local area network IDF #036M.

F. University Preferred Selection: Hubbell #HXJ6BK or OTDI approved equal.

2.02 MODULAR COPPER JACKS AND CONNECTORS FOR WIRELESS ACCESS POINTS

A. Provide a single-port biscuit jack Hubbell HJ6AGY or OTDI approved equal with Cat 6A gray jack located above the ceiling for wireless access points.

B. Extend (1) Cat 6A cable from access point outlet to nearest Telecommunications Room.

C. Provide a 1’ CAT 6A patch cord for each end and permanent link test for performance.

D. Provide 10’ service loop with excess cable stored on J-hook.

E. Provide single-gang Caddy Bracket in ceiling tile for support of access point.

F. Refer to Exhibit F & G in OTDI Standards Appendix M for installation guidelines.

2.03 MODULAR COPPER JACKS AND CONNECTORS FOR WALL TELEPHONES

A. Wall phone outlets shall be stainless steel, equipped with a flush CAT6 data jack, and designed for modular mounting of wall phones.

B. Basis of design: Hubbell #SP6F or equal.

C. Mounting shall be ADA compliant.

2.04 MODULAR WORK AREA FACEPLATES

A. Modular work area faceplates with the number of modular openings as shown on project drawings. Faceplates shall contain four, six, eight, or ten openings.

B. Openings without jacks installed shall have blank inserts installed, Hubbell #SFBI10 or OTDI approved equal.

C. Provide modular mounting frames as required in surface wiremold.

D. The faceplate shall be stainless steel or plastic in accordance with the architectural design. At a minimum, stainless steel covers shall be used in areas constructed as cleanroom environment.

E. All faceplates in laser lab, airlock, and adjacent mechanical room (cleanroom environment) shall have neoprene gasket to mitigate air leaks.

2.05 MOUNTING ELEMENTS

A. Conduit, surface-mounted raceways, and sleeves shall be provided by the Electrical Contractor. This Contractor shall be responsible to coordinate with the Electrical Contractor, to confirm that proper box sizes shall be provided, and immediately notify the Electrical Contractor of any errors or inconsistencies encountered.

B. Any required metallic surface raceway shall be provided by the Electrical Contractor. This Contractor shall be responsible to coordinate with the Electrical Contractor to confirm that proper box styles and sizes shall be provided, and immediately notify the Electrical Contractor of any errors or inconsistencies encountered.

C. Surface raceway installations shall be reviewed and approved by University OTDI before installation.

2.06 HORIZONTAL UTP CABLE FOR VOICE/DATA

A. Voice and data cables shall be Category 6 rated, consisting of 4-Pair 24 AWG UTP, listed CMP with transmission characteristics that meet and exceed those of ANSI/TIA/EIA-568-B performance specifications.

B. Hubbell #HC6 or OTDI approved equal.

C. CAT6 Plenum Cable – Hubbell #C6RPW or approved equal.

D. Cable shall be white in color.

2.07 VERTICAL CABLE MANAGERS

A. Vertical cable managers shall be 78 inches high by 3 inches wide, minimum, and shall be black in color. Front management capabilities shall be provided.

B. 10” wide vertical cable management shall be dedicated to each side of each rack, as depicted in project drawings.

C. Hubbell VM610 or OTDI approved equal.

2.08 HORIZONTAL CABLE MANAGERS

A. Horizontal Cable Managers with cover shall be 19 inches wide by 3.5 inches high and shall be black in color. Front management capabilities shall be provided. Front Cable Managers shall be ring style from left to right across each 3.5” horizontal as depicted in project drawings.

B. University Preferred Selection: Hubbell #HM27C or OTDI approved equal.

2.09 MULTIPLE OUTLET POWER STRIPS

A. Multiple outlet power strips shall have ten (10) NEMA 5-20R receptacles and surge suppression. Provide line cord and 5-20P plug length sufficient to access power receptacles as indicated on drawings. Units shall include on/off switches positioned at the top/rear of each strip.

2.10 MODULAR COPPER PATCH PANELS

A. 48-Port High Density RJ-45 Modular Patch Panels with 110-style connecting blocks for the termination all UTP cables, as required.

B. Patch Panels must meet or exceed all transmission performance requirements for Category 6.

C. Each RJ-45 port will be terminated with 4-Pairs of UTP cable, unless otherwise directed (example: “Rack-to-Wall Tie Cabling”).

D. All Patch Panel Ports shall be black in color.

E. OTDI Preferred Selection: Hubbell #HPJ24 and #HPJ48 or OTDI approved equal.

2.11 COPPER PATCH CORDS

A. Category 6, 8-conductor stranded copper Patch Cords with RJ-45 Plugs.

B. All Patch Cords shall be tested and included in the structured cabling system warranty for the manufacturer-certified solution proposed.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine pathway elements intended for Data/Voice Structured Cabling. Check conduits, raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installations, and other conditions affecting installation. Proceed with installation only after any unsatisfactory conditions have been corrected.

B. Allow sufficient cable length for work area outlet details such that wall locations can be adjusted anywhere within the assigned room prior to and until time of installation.

INSTALLATION – INTRABUILDING CABLING SYSTEM

A. The Contractor shall furnish and install all communications cables, connectors, cable, etc. for a complete telephone/voice and data communication wiring system. The Contractor shall terminate all wiring as directed by OTDI. All cross connects are by OTDI.

B. Whenever possible, primary cable routing paths shall follow the logical structure of the building. This means that all cable servicing an area should follow hallways. When a wall must be breached, provide sleeved openings. Cabling shall enter and exit these areas at 90° angles. This minimizes potentially harmful field effects on the data signal from other powered devices in the run area (such as fluorescent lighting, air handlers, etc.). Corridor crossovers should be kept to a minimum. Route all cables in cable trays parallel to and perpendicular to building structure. No diagonal runs will be permitted, unless noted otherwise.

C. All cable shall be installed as single continuous "home run" pulls from connector block to telephone/data outlet. No in-line connectors or splices, etc., will be permitted.

D. The maximum length of user voice and cables shall be limited to 90 meters from the user data faceplate to the IDF blocks. The maximum length of user data cables shall be limited to 90 meters from the user data faceplate to the IDF patch panels.

E. Cable runs shall be kept a minimum distance from the following sources.
   1. Minimum clearance distance requirements:
      a. 5 inches (125 mm) from power lines of 5 KVA or less
      b. 12 inches (305 mm) from lighting fixtures
      c. 39 inches (1 m) from power lines of 5 KVA or greater
      d. 39 inches (1 m) from transformers and motors

F. Velcro and supports shall not pinch, bind, crimp or in anyway cause physical damage to, or cause electrical characteristic alterations to the telephone/voice and data cables.

G. Cabling Contractor shall take care to assure that during and upon completion of the installation, all cables are free of kinks, sharp bends, twists, gouges, cuts or any other physical damage that may cause physical or electrical characteristic alterations to the cables.

H. Cabling Contractor shall observe all minimum bend radius and tension limitations, etc., as specified by the cable manufacturer when installing the cables.

I. It is absolutely imperative that extreme care be exercised when installing the Category 6 data cables, since sharp bends or cable kinks will adversely affect the high-speed electrical performance of the cable.

J. Category 6 data cables must be terminated in accordance with EIA/TIA-568 wiring practices. Since Near End Crosstalk (NEXT) is adversely affected by wiring practices, it is important that the Contractor preserve wiring twists as close as possible to the point of mechanical termination. The amount of "un-twisting" in a pair as the result of termination to connector hardware shall be no greater than 9 mm (3/8 inch).

K. Where cables pass through walls, the Contractor shall provide the minimum clearance hole for a conduit sleeve to pass the cables through. Patch and repair any holes, removals, adds or other damage. Paint to match.

L. Cables that require service loops or additional length should be coiled at ten (10) feet and placed above the data rack. The coil shall be located in the MTR’s and IDF’s.

M. Cable routing from the cable tray onto the distribution frame shall be neatly organized and supported by cable support brackets, cable clips, cable loops, etc., as required to minimize tension and stress on the connector block terminations.

3.02 IDENTIFICATION

A. Comply with general requirements of ANSI/TIA/EIA-606-A.

B. Each technology outlet (TO) shall be identified with a unique identifier. Each TO shall be labeled with the TR room number which the cable terminates in, and a four digit number which the first number will identify the floor the TO is on and a three digit following that:

1. For example: for cable number 21 on the 2nd floor terminating in the second floor TR room 214 the unique identifier would be 214-2021 if the same cable was on the 3rd floor terminating in the same closet it would be labeled 214-3021.

2. Each floor shall be placed on its own patch panel.

4. All numbering will be sequential and flow left to right on patch panels. When TR(s) contain different floors there will be 3 rack units left blank for each floor for future adds.

C. Post cable schedule in a prominent location in each MTR and IDF. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules in Microsoft Excel format for inclusion in O&M Manuals.

3.02 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports for inclusion in the O&M Manuals.

1. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

2. Copper Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use Class 3, Bi-directional, Category 6 Tester. Test for faulty connectors, splices, and terminations. Test according to ANSI/TIA/EIA-568B Category 6 parameters including, Wiremap, Length, NEXT, Insertion Loss (Attenuation), PSNEXT, ELFEXT, PSELFEXT, Structural Return Loss, Propagation Delay, Delay Skew.

3. This Contractor shall provide 5-days' notice to OTDI prior to commencing cable testing. OTDI shall, at its discretion, be present to observe any and all cable test procedures. Cable testing procedures shall be acceptable to OTDI.

4. This Contractor shall produce test reports to be accepted by OTDI. Test reports shall be completely and legibly filled out, dated, and signed by the person performing the tests. The completed forms shall be submitted to OTDI for review and acceptance. Provide a digital record of the test results in MS Word or FLW format.

B. Remove malfunctioning units, repair or replace with new units, and re-test as specified above.

C. Upon completion of installation and acceptance by OTDI, the cabling contractor will contact OTDI for witness testing. OTDI will be given at least one week (5 working days) advanced notice for testing.

a. To be tested the system must be complete, this includes all pathways, cabling dressed, labeling, faceplates secured and fire stopping.
b. All testing shall be done with a CCTT (certified cable testing technician); the CCTT shall perform all testing.
c. The approved test instrument is the Fluke Versiv (DSX-5000) or OTDI approved equal. MARGINAL TESTS WILL NOT BE ACCEPTED. Test Instruments shall be within its 12-month calibration period and have the latest software and firmware versions installed. If the test instruments is not within calibration period, testing will not take place.
d. Permanent link test results, including individual frequency measurements, shall be recorded in the test instrument for subsequent uploading to a PC, using Fluke software, from which administrative documentation (testing reports) may be generated.
e. Testing shall be performed on each cabling segment (connector to connector). Sampling is not acceptable.

f. OTDI will witness all setup and referencing of test instruments prior to testing.

END OF SECTION

SECTION 28 31 00

FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. All of the Contract Documents, as listed on the Table of Contents and including General and Supplementary Conditions and Division 1, General Requirements, shall be included in, and made part of, this Section.

1.02 DESCRIPTION OF WORK

A. The scope of work shall be limited to that work required to add audio/visual devices in the renovated areas.

B. As it pertains to "A" above; furnish and install all components, peripherals, cabling terminations, re-programming and re-testing of the existing Simplex microprocessor based, analog/addressable voice-annunciated fire alarm system according to the following specifications and as shown on the drawings.

C. As it pertains to "A" above, the system shall utilize distributed processing techniques, be totally solid state, microprocessor based, and use digital transmission techniques, to ensure reliable operation, low maintenance costs and long life. The system shall be of the modular design to allow expansion with a minimum of hardware additions to support future renovations throughout all unrenovated space. System operation shall not require personnel with special computer operational skills.

D. As it pertains to "A" above; the system shall include all necessary hardware, software and peripheral devices to perform the following functions:

a. Fire/smoke detection and alarm
b. One way voice evacuation signaling
c. System supervision
d. Trouble indications
e. Control functions, such as:
    1. Elevator recall
    2. Egress door release
    3. Magnetic hold open release
    4. Smoke damper operation
    5. Air handler shut-down
f. Status monitoring of non-system equipment, such as:
    1. Sprinkler/standpipe system
    2. Suppression system control panels
g. Report alarm and trouble signals to Campus Central Station.

b. The existing Simplex 4100U Fire Alarm Control Panel shall remain. The existing Simplex panels, including all transponder panels, remote

annunciators, NAC extender panels, etc. shall be verified and expanded to annunciate all new and existing alarm and trouble signals.

1.03 RELATED WORK

A. For work to be included as part of this Section, to be furnished and installed by the Electrical Contractor, refer to the following Sections:
   a. Section 260020 – Work Included
   b. Section 260030 – Codes and Fees
   c. Section 260126 – Tests and Inspections
   d. Section 260519 – Wire and Cable
   e. Building Design Standards 28 31 00.2.1
   f. Section 260533 – Raceways and Boxes

B. Carefully examine all of the Contract Documents, criteria sheets and all other Sections of the Specifications for requirements which affect work under this Section, whether or not such work is specifically mentioned in this Section.

1.04 REFERENCES

A. The following list of Reference Standards shall be used in system design, installation, operation and maintenance. The Reference Standards used shall be the latest applicable edition of said Reference Standards unless otherwise approved (NFPA - National Fire Protection Association):
   1. Ohio Building Code, 2017 Edition.
   2. Ohio Electrical Code.
   3. Ohio State Fire Marshall.
   4. NFPA 70 – National Electrical Code – 2017 Edition
   5 NFPA 72 A, B, C, B and E – National Fire Alarm and Signaling Code - 2016 Edition
   g. NFPA Standard 90A
   h. NFPA 101 – Life Safety Code - 2015 Edition
   i. Underwriters Laboratories (UL)
   j. International Municipal Signal Association Cable Specifications
   k. Approved List of Materials and Methods of Construction for Municipal Fire Alarm
   l. Americans with Disability Act, ICC A117.1-2017.

B. Each item of the fire alarm system shall be listed as a product of a single fire alarm manufacturer under the appropriate UL category and shall bear the UL label.

C. All control equipment shall be listed under UL UOJZ.

1.05 QUALITY ASSURANCE

A. The manufacturers listed within this specification section have been preselected for use on this project. No submittal will be accepted from a manufacturer other

than specified. The Contractor shall provide all peripheral devices that have been previously reviewed and approved by the owner.

B. To ensure system compatibility, all components of the fire alarm system including control panels, alarm initiating devices, alarm indicating devices, etc. shall be the products of one manufacturer.

1.06 WARRANTY

A. Attention is directed to provisions of the General Requirements, Supplementary General Requirements, and Division 01 regarding guarantees and warranties for the work under this Contract.

B. The warranties for the fire alarm system shall be one (1) year regardless of other warranties.

1.07 ACCEPTABLE MANUFACTURERS

A. All peripheral devices to interface with existing Fire Alarm System.

1.08 MANUFACTURER'S REPRESENTATIVE

A. The Electrical Contractor shall provide, at the appropriate time or as directed by A/E, the on-site services of a competent factory trained technician of the manufacturer of the fire alarm equipment to inspect, test, adjust and place in proper operating condition any and all items of the same manufacturer. No additional compensation will be allowed for such services. A written report shall be issued by the particular manufacturer with his findings for the A/E's record.

B. All final connections, testing and adjusting of the system shall be done under the direct supervision of the system supplier. After completion of the installation, a trained technician employed by the system supplier shall demonstrate the system to the satisfaction of the owner and shall make all additional adjustment to the system operation as required by the owner as a result of this demonstration.

1.09 SUBMITTALS

A. Prepare and submit shop drawings in accordance with the requirements hereinbefore specified, and with the Shop Drawings, Product Data and Samples Section, in the manner described therein, modified as noted hereinafter. The fire alarm system layout shall show the existing, with the additional (according to "1.02.A") above, highlighted to indicate the NEW work added.

B. All shop drawings shall have clearly marked the appropriate specification number of drawing designation, for identification of the submittal. The shop drawings shall clearly identify which products will be provided.

C. Disposition of shop drawings shall not relieve the Electrical Contractor from the responsibility for deviations from drawing or specifications, unless he has submitted in writing a letter itemizing or calling attention to such deviations at

time of submission and secured written approval from the A/E, nor shall such disposition of shop drawings relieve the Electrical Contractor from responsibility for errors in shop drawings or schedules.

D. Fire alarm system shop drawings shall contain the following information. Shop drawings that are missing any information described below will not be reviewed:
   1. A detailed list of each piece of equipment with model numbers and UL listings for each system component.
   2. Manufacturer's specification sheets for each item listed above.
   3. A description of how the specified system functions.
   4. Confirmation that the manufacturer's representative will provide jobsite supervision during the installation of the system, perform the final testing of the system, and instruct the operating personnel on the operation of the system.
   5. Stand-by battery calculations.
   6. Amplifier calculations.
   7. Power supply calculations.
   8. Detailed 1-line schematic wiring diagrams of the specified system and the interconnection wiring.
   9. Floor plans indicating location of all devices including location of all visual alarms.

1.10 CLOSEOUT SUBMITTALS AND O & M MANUALS

A. The following information shall be submitted for record purposes, in a binder, prior to final payment:
   1. Final as-built drawings and information for items listed above. As-built drawings shall be in AutoCAD and shall be submitted to the owner at substantial completion of the project.
   2. Operation and maintenance manuals with the following information:
      a. Instruction books and/or instruction leaflets
      b. Recommended renewal parts
      c. A list of addresses of all peripheral devices connected to the system
   3. Wiring diagrams (AutoCAD format).
   4. Certified test reports.

1.11 CIRCUITING CRITERIA

A. Signaling Line Circuit
   1. Initiating device wiring shall be configured as Class A, Style D.
   2. A separate addressable initiating device circuit for each floor shall terminate on separate communication card in the fire alarm control panel. The system shall be designed with a maximum of 75% of the devices each communication card is capable of supporting.

B. Speakers Circuits
   1. Speaker circuit wiring shall be configured as Class A, Style Z.

2. Termination at shield on twisted shielded cable shall be verified per manufacturer's recommendation prior to energizing speaker circuits to ensure proper grounding and eliminate system-wide speaker noise.

C. Visual Strobes
1. Visual Strobe circuit wiring shall be configured as Class A, Style Z.

1.12 SYSTEM SUPERVISION

A. The following systems and equipment shall be electronically supervised:
1. All electronic circuit cards in the system
2. Audio amplifiers
3. Power supplies
4. Battery charger/batteries
5. Alarm initiating devices
6. Initiating device wiring
7. Audio device wiring
8. Visual appliance device wiring
9. System network wiring
10. System LED's for burnout or disarrangement

B. Systems listed above shall be electronically supervised for:
1. Failed or missing electronic components/circuit cards
2. Failure of audio amplifiers
3. Failure of power supplies
4. Failure of battery charger and/or batteries
5. Loss of signal from alarm initiating device
6. Missing initiating device
7. Failed initiating device
8. Open circuit wiring
9. Short circuit wiring
10. Short to ground wiring

1.13 AUTOMATIC SYSTEM OPERATION

A. Normal Operation
1. Under normal operation the front panel of the fire alarm system, fire command center and remote annunciators shall display a "SYSTEM IS NORMAL" message and the current time and date.
2. The system shall continually monitor all components of the system, peripheral devices and system wiring for changes in status. The system shall alert any such changes following the sequences listed below.

B. Alarm Condition
1. Events to Activate Alarm Condition
a. Manual activation of a fire alarm pull station
b. Automatic activation of the following:
1) Heat detector
2) Duct mounted smoke detector
3) Sprinkler system water flow switch

2. Alarm Condition Operation
    a. Any event activating an alarm condition shall immediately result in the following:
        1) Sound the alarm signal at the control panel, fire command center and remote annunciator and the system alarm LED shall flash.
        2) Display the assigned English language message and activated event, with time, date and code, for the point in alarm on the alpha-numeric display at the control panel, fire command center and remote annunciators. The top line of alpha-numeric display shall be the point label including device type and the second line shall indicate the device location (floor and room number). Note: The room number used for identification shall be the room number as assigned by the architect and not, necessarily, the number indicated on the drawings.
        3) The appropriate alarm LED shall flash on the LED annunciator.
        4) Transient alarms to be transmitted to campus reporting system via a Lenel ACAMS system.
        5) Sound an alert signal to all locations within the building. The alert signal tone shall be constant 900 Hz pulsed to produce two (2) rounds of the code four-four-four (4-4-4), duration of each round shall be approximately (15) seconds with an interruption between rounds of approximately (3) seconds.
        6) Activate a pre-recorded digital voice message to all locations within the building.
            a) The horn tone shall be transmitted three (3) times.
        7) All visible alarm indicating appliances in the building shall flash continuously.
        8) All doors in the building normally held open by door control devices shall release.
        9) Activate all motor operated fire and smoke dampers.
        10) Automatically unlock, but not unlatch, all locked stairwell doors.
        11) Shut down air handling units.
3. Elevator Recall Function Initiation
    a. In addition to the alarm condition operation described above, the activation of smoke detectors within elevator lobbies, elevator machine rooms shall initiate the elevator recall function.
    b. Each elevator car shall be captured, separately, and recalled to the main floor. If the alarm originated on the main floor, the elevator shall be recalled to the designated alternate floor.

C. Trouble Condition
1. Events to Activate Trouble Condition
    a. Failed or missing electronic components/circuit cards
    b. Failed or missing audio amplifier
    c. Failed or missing power supplies
    d. Failed or missing battery charger
    e. Failed or missing batteries
    f. Low battery condition
    g. Loss of signal from alarm initiating device
    h. Missing initiating device
    i. Failed initiating device

j. Open circuit system interconnection wiring
k. Short circuit system interconnection wiring
l. Short to ground system interconnection wiring
m. Auxiliary manual controls switches in “off Normal” position

2. Trouble Condition Operation
   a. Each component of the system as identified above shall be supervised and uniquely identified on the alpha-numeric display at the control panel, fire command center and remote annunciator. In addition a corresponding yellow LED shall flash.
   b. The system trouble audible signal shall be activated at the control panel, fire command center and remote annunciator.
   c. Device identification shall be transmitted to the control panel for processing according to the program instructions.
   d. Should a component become non-operational, tampered with, or removed, a discrete trouble signal, unique to the device, shall be transmitted to, and annunciated at, the control panel, fire command center and remote annunciator. The system control panel will be capable of displaying the type of trouble condition (open, short, ground, device missing/failed).
   e. Should a device fail it shall not hinder the operation of other system devices.
   f. There shall be no limit to the number of components indicating a supervisory condition, simultaneously.

D. Supervisory Condition
   1. Events to Activate a Supervisory Condition
      a. Activation of any standpipe valve supervisory (tamper) switch
      b. Activation of any sprinkler valve supervisory (tamper) switch
   2. Supervisory Condition Operation
      a. The supervisory condition shall send a signal to the campus reporting station via a digital dialer.
      b. The supervisory condition shall be uniquely identified on the alpha-numeric display at the control panel, fire command center and remote annunciator. In addition a corresponding yellow LED shall flash.
      c. The system supervisory audible signal shall be activated at the control panel, fire command center and remote annunciator
      d. Differentiation between a supervisory condition and a trouble condition shall be provided.
      e. Restoring s standpipe or sprinkler valve to its normal position shall cause the supervisory condition LED to extinguish and the audible signal to pulse indicating the restoration to normal condition.

E. Abnormal Condition Acknowledging
   1. Pressing the acknowledge button shall display the first unacknowledged abnormal condition, and require another acknowledge action to acknowledge the next point displayed. As each unacknowledged abnormal condition is acknowledged a message will be displayed informing the user that the abnormal condition has been acknowledged. After all points have been acknowledged, the LED’s shall glow steady and the audible alarm will be silenced. The total number of alarms, supervisory and trouble conditions shall be displayed along with a

prompt to review each list chronologically. The end of the list shall be indicated by an end of list message “END of LIST”.

2. These acknowledge functions may be passcode protected if the user has insufficient privilege to acknowledge such conditions. A message shall indicate insufficient privilege but allow the user to view the points without acknowledging them.
3. Any subsequent abnormal conditions, after all other abnormal conditions have been acknowledged, shall reactivate the alarm signal at the panel.

F. Alarm Silencing
1. When the “ALARM SILENCE” button is activated all audible alarm signals shall cease operation, visual signals will continue to flash until the visual signal stop switch is activated, or system is reset.
2. Any subsequent alarm, after the alarm silence button is activated, shall reactivate all audible alarms and visual signals.
3. Should a supervisory trouble condition be present within the system and the audible trouble signal silenced, the trouble signal shall resound at preprogrammed time intervals to act as reminder that the fire alarm system is not 100% operational. Both the time interval and the trouble reminder signal shall be programmable to suit the owners’s application.

G. System Reset
1. The SYSTEM RESET button shall be used to return the system to its normal state after an alarm condition has been remedied. The LCD display shall step the user through the reset process with simple English Language messages. Messages, “SYSTEM RESET IN PROGRESS”, will first be displayed followed by the message, “SYSTEM RESET COMPLETED”, and finally, “SYSTEM IS NORMAL”, if all alarm conditions have been cleared.
2. Should an alarm condition continue to exist the message, “SYSTEM RESET IN PROGRESS”, will be followed by the message, “SYSTEM RESET ABORTED”, and the system will remain in an abnormal state. System control relays shall not reset. The audible alarm at the panel and the alarm LED will be on.
3. Any subsequent alarm, after system reset, shall reactivate the entire system.

H. Priorities
1. The system shall provide for priorities of different types of alarms and supervisory or trouble indications. Fire alarm points shall have the highest priority level. Other alarms and supervisory or trouble indications shall have the second level of priority and conditions that do not require operator involvement will be the third level of priority. All control points shall be assigned to the appropriate priority to assure proper operation during an emergency condition.

1.14 STATUS MONITORING OF NON-SYSTEM EQUIPMENT

A. Separate, life safety, supervised indication shall be provided to annunciate status, at the control panel, and remote annunciator, via necessary auxiliary relays with dry contacts at the equipment, and monitor modules for the following status points:
1. Valve tamper at fire pump
2. Fire pump “running”

3. Fire pump “power loss”
4. Fire pump “phase reversal” each pump
5. Sprinkler valve tampers by device
6. Standpipe valve tampers by device

1.15 SYSTEM OPERATION DURING LOSS OF NORMAL POWER

A. The fire alarm system shall operate as indicated above, utilizing battery back-up. The “SYSTEM IS NORMAL” message at all alpha-numeric displays shall change to “SYSTEM ON BATTERY POWER”, the green “Power On” LED shall extinguish, the yellow trouble LED shall flash and the audible device shall sound.
B. Acknowledging the condition, as described above, shall silence the audible device and the LED shall glow steady. The system shall remain in this state until normal power is restored.
C. All doors normally held open by door hold-open devices shall release.

1.16 MANUAL SYSTEM OPERATION

A. A manual evacuation (drill) switch shall be provided at the control panel to operate the alarm indicating appliances, without causing other control circuits to be activated. However, should a true alarm occur, all alarm functions shall occur as described previously.
B. Auxiliary bypass switches shall be provided for the following:
   1. Door hold open release
   2. Audio/Visual device disable
   3. Elevator recall bypass
   4. Fan control bypass (i.e. H-O-A switches)
C. Activation of auxiliary by-pass switches shall override the selected automatic functions, and indicate a trouble condition at the control panel, fire command center and remote annunciator.

1.17 SYSTEM PROGRAMMING

A. The fire alarm system shall allow for loading and editing of special instructions and operating sequences as required. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile, programmable memory within the fire alarm control panel. Loss of primary and secondary power shall not erase the instructions stored in memory.
B. Full flexibility for selective input/output control functions shall also be incorporated in the resident software programming of the system.
C. Resident software shall allow for full configuration of initiating circuits so that additional hardware shall not be necessary to accommodate changes.
D. The fire alarm manufacturer shall include in his bid a minimum of two (2) additional system reprogramming procedures to allow last minute additions to the system based on the State Fire Marshal review of operation.

1.18 SYSTEM TESTING

A. Enable Walk Test

1. The actuation of the “enable walk test” program at the control panel shall activate the “Walk Test” mode of the system which shall cause the following to occur:
    a. The city circuit connection shall be by-passed.
    b. Control relay functions shall be by-passed.
    c. The control panel shall show a trouble condition.
    d. The activation of any alarm initiation device shall cause the audible signals to code a number of pulses to match the zone number.
    e. The panel shall automatically reset itself after signaling is complete.
    f. Any momentary opening of an initiating or indicating appliance circuit wiring shall cause the audible signals to sound for 4 seconds indicating a trouble condition.
    g. The system shall have the capacity for multiple distinctive walk test groups. Such that only a portion of the system need be disabled during testing.
2. Walk Test Voice Message
    a. The fire command center shall include a passcode protected voice message panel switch for broadcasting a system testing message manually prior to system testing.
    b. After gaining access to the feature, the system shall allow activation of a panel switch that will broadcast two (2) rounds of the test message, then stop. The panel shall include an LED that will illuminate when this feature has been activated.
    c. After gaining access to the feature, the system shall allow activation of a panel switch that will broadcast two (2) rounds of the test, then stop. The panel shall include an LED that will illuminate when this feature has been activated.

B. Silent Walk Test with History Logging
1. The system shall be capable of being tested by one (1) person. The control panel shall be capable of supporting multiple, separate testing groups whereby one group of points may be in a testing mode and the other (non-testing) groups may be active and operate as programmed per normal system operation.
2. While in testing mode, the alarm activation of an initiating device circuit shall be silently logged as an alarm condition in the historical data file. The panel shall automatically reset itself after logging of the alarm.
3. The momentary disconnection of an initiating or indicating device circuit shall be silently logged as a trouble condition in the historical data file. The panel shall automatically reset itself after logging of the trouble condition.
4. Should the walk test feature be on for an inappropriate amount of time, it shall revert to the normal mode automatically.
5. After testing is considered complete, testing data may be retrieved from the system in chronological order to ensure device/circuit activation.
6. Should an alarm condition occur from an active point, not in walk test mode, it shall perform operations described under operation.

C. The system shall be capable of disabling or enabling circuits individually for maintenance and testing purposes.

1.19 HISTORY LOGGING

A. The control panel shall have the ability to store a minimum of three hundred (300) events in an alarm log plus an additional three hundred (300) events in a

separate trouble log. These events shall be stored in non-volatile, battery protected memory Real time and date shall accompany all history event recording.

B. The following historical alarm log events shall be stored:
Alarms
Alarm Acknowledgement
Alarm Silence
System Reset
Alarm Historical Log Cleared

C. The following Historical Trouble log events shall be stored:
Trouble Conditions
Supervisory Alarms
Trouble Acknowledgement
Supervisory Acknowledgement
Alarm Verification Tallies
Walk Test Results
Trouble Historical Log Cleared

PART 2 – PRODUCTS

2.01 CAMPUS NOTIFICATION

A. The building shall use the existing input control module for transmission of alarm and trouble signals to the existing building Simplex FACP.

B. The materials, wiring and equipment shall be designed and built in accordance with the best practices of the electrical industry and shall conform to the standards of:

1) National Electrical Code
2) The National Electrical Safety Code
3) Applicable State and Local Regulations
4) National Fire Protection Association
5) UL listed or Associated Factory Mutual Insurance Company listed

2.02 SYSTEM INTERFACE MODULES

A. General
1. System interface modules shall communicate over the same lines as the other addressable devices and shall receive their operating power from a separate source within the fire alarm control panel.

B. Communicating Device Module
1. All alarm initiating devices indicated on the electrical drawings shall be addressable. These devices shall report to a communicating device module in the control panel. Each module will communicate with the microprocessor to continually poll the remote devices for normal, abnormal, shorted, and open line conditions.

2. The communicating device module shall continuously interrogate each of the addressable devices on its communications channel for status changes and/or trouble conditions.
3. The system shall communicate with each initiation device individually and each device shall be individually annunciated at the control panel, fire command center and remote annunciator.
4. Each device shall have the capability of being disabled or enabled, individually.
5. As a minimum, a separate, isolated circuit shall be provided for each floor.
6. The number of addressable devices connected to the communicating device module shall not exceed 75% of its capacity, to allow for future expansion.
7. Each addressable device must be uniquely identified by an address code at time of installation. Verbiage at each alpha-numeric display shall, as a minimum, indicate device type, floor and room number. Room number shall be as designated by the architect and not necessarily the room number indicated on the drawings.
8. Sensing circuits from the communicating device module shall be “Class A” McCulloh, supervised to provide an indication of sensing circuit faults. Supervision points shall not reduce available system alarm points. Control points shall be capable of initiating remote alarm signals or systems, and providing a momentary pulse to allow reset of remotely located fire or other types of local controls, by using the manual control feature of the system keyboard.

C. Monitor Module
1. Monitor modules shall supervise and monitor the status of non-addressable, normally open, direct contact devices such as sprinkler water flow switches and valve tamper (supervisory) switches. These monitor modules shall communicate the equipment status (normal, alarm, trouble) to the control panel.
2. Monitor modules shall also be used to indicate status of equipment such as, suppression system control panels, conventionally wired fire alarm devices, fire pump controllers, and other systems as indicated on the drawings.

D. Control Module
1. Control modules shall supervise and control the operation of auxiliary devices. Control modules shall also operate functions such as building fans and dampers, elevator recall, release door hold back devices, as well as any other system control functions indicated on the drawings or mentioned in these specifications.
2. Control modules shall provide 2-pole, 2-throw, supervised relay switching that may be used to connect through easily replaceable 2A fuses.
3. Control modules shall communicate the supervised wiring status (normal, trouble) to the fire alarm control panel and will receive a command to transfer the relay from the fire alarm control panel.

2.03 ALARM INDICATING DEVICES

A. Combination Horn and Strobe
1. Furnish and install combination audio/ADA visual alarm assemblies, mounted with red impact resistant and flame retardant thermoplastic injection molded frame and ADA compliant strobe lamp. Mounting height shall be from the bottom of unit even with the top of door frame but not less than 80” above the floor to the bottom of the device box.

2. Speakers
   a. Furnish and install audio alarm assemblies, mounted with red impact resistant and flame retardant thermoplastic injection molded. Mounting height shall be from the bottom of unit even with the top of door frame but not less than 80" above the floor to the bottom of the device box.
   b. Visual strobes
      1) Visual strobes shall have an intensity of 15/75, 30/75, 60/75, 75 or 110 candela and comply with ADA Standards. All visual strobes throughout the facility shall be synchronized.
   c. Visual strobe intensities shall be as follows:

1)	Bathrooms	15/75
2)	Rooms smaller than 100 sq. ft.	15/75
3)	Rooms from 100 to 400 sq. ft.	75
4)	Rooms larger than 400 sq. ft.	110

3. The entire assembly shall meet UL 1480 testing procedures.

2.04 WIRING

A. All field wiring for the Fire Alarm panel and accessory control shall enter a 4 x 4 duct below the panels. There shall be no connection other than through the side or bottom of the cabinets and through the ducts.

B. #14 AWG stranded shall be minimum used for fire alarm remote annunciators. Limited energy cable shall have FPLP or FPLR insulation labeled for fire alarm circuits and be used for fire alarm systems requiring limited energy cabling.

2.05 SPARE PARTS

A. The fire alarm system shall be furnished with spare parts and shall be turned over to the owner as required.

B. The following list of spare parts shall be supplied:
   1. (2) Horn/Strobe notification devices

C. The spare parts list shall be submitted as part of the equipment shop drawing submission.

D. Turn over all spare parts to the owner and obtain a signed receipt. A copy of the receipt shall be included in the Operation and Maintenance Manual.

PART 3 – EXECUTION

3.01 COOPERATION AND WORK PROGRESS

A. The Electrical Contractor shall cooperate with the A/E, and all other existing building operations occurring at the site. The Electrical Contractor shall coordinate the work and proceed in a manner so as not to delay the progress of the project.

B. The Electrical Contractor shall coordinate his work as conditions permit and such that interruptions of the building functions will be at a minimum. Any overtime hours worked or additional costs incurred due to lack of or improper coordination with the owner by the Electrical Contractor shall be assumed by the Contractor without any additional cost to the owner.

C. The Electrical Contractor shall furnish information on all equipment that is furnished under this Section but installed under another Section as specified herein.

D. The Electrical Contractor shall provide all materials, equipment and workmanship to provide for adequate protection of all electrical equipment during the course of the project. This shall also include protection from moisture and all foreign matter. The Electrical Contractor shall also be responsible for damage which he causes to the work of existing conditions, and he shall remedy such injury at his own expense.

E. The Electrical Contractor shall acquire a certification of functionality from the manufacturer, having proven that the system installed under this contract is free of faulty devices, ground-faults and open circuits and that the system functions fully as designed.

F. Wire and cable shall be sized and installed per Specification Section 26 05 19, “Wire and Cable” and shall be type FPLP or FPLR for limited energy cable, or THHN for non-power limited cable. Requirements for use of power limited or non-power limited wiring shall be as directed by equipment manufacturer.

3.02 INSTALLATION

A. General

1. Furnish and install the complete fire alarm system expansion in accordance to the drawings, these Specifications and all applicable Codes and Ordinances and in accordance with the manufacturer's recommendations.
2. The Electrical Contractor shall furnish and install, in accordance with manufacturer's instructions, all wiring, conduit and outlet boxes required for the erection of a complete system as described herein and as indicated on the drawings.
3. Final connections between the control equipment and wiring system shall be made under direct supervision of a representative of the manufacturer.
4. The system shall be fully functioning in occupied areas. When a system outage is required for cutover or to add on to the existing system, the Contractor shall provide a fire watch program meeting city requirements.
5. Installation of equipment and devices that pertain to other work in the Contract shall be closely coordinated with the appropriate Contractors. The Electrical Contractor shall clean all dirt and debris from the inside and the outside of the fire alarm equipment after completion of the installation.
6. Cover all smoke detection devices with plastic bags immediately after installation to maintain cleanliness. If detectors are contaminated with dirt or dust during the construction period, it shall be the responsibility of the Electrical Contractor, at his

cost, to clean or replace each device as directed by the Authority Having Jurisdiction.

7. All miscellaneous hardware and support accessories, including support rods, nuts, bolts, screws and other such items, shall be furnished as required for proper installation of the system and shall be of a galvanized or cadmium plated finish, or of other approved rust-inhibiting coating.
8. The Electrical Contractor shall ensure that all concealed equipment that may require maintenance or access for any reason are made easily accessible.

B. Raceways
   1. All fire alarm system wiring shall be run in conduit shall meet the requirements of NEC Article 760 and all National, State and Local Electrical Codes. Conduit sizes shall be determined by the fire alarm equipment manufacturer to support the quantities and types of wiring to be installed. All wiring to be run in a ¾" minimum conduit size and conduit system separate from all other systems.
   2. All pull and junction boxes shall be spray painted red and labeled "Fire Alarm". Wiring color code shall be maintained throughout the installation.

C. Wiring
   1. All wiring for the Fire Alarm Systems shall be color coded.
   2. Each wire shall have a numbered tag at both ends.
   3. All fire alarm wiring shall be run in a 3/4" minimum conduit size and conduit system separate from all other systems. Conduit compression couplings shall be required to be used for all fire alarm system conduits.
   4. All system wiring shall be stranded and/or solid copper, minimum 75 degree C insulation, Type FPLP, FPLR, and XHHW-2 for Utility Plant applications, and shall be used for initiating and communicating devices as permitted by National Electrical Code (NEC -760). The A/E is required to witness the wire type on site prior to the wire being pulled.
   5. Nylon insulation jacketed cables are prohibited. THHN/THWN cables are prohibited for use in fire alarm systems.
   6. Flame retardant PVC jacketed cables are required. Cable must have resistance to flame spread and reduce smoke generating properties.
   7. Cabling for the floor's fire alarm system devices: The cable shall not penetrate floors or ceilings (i.e. cable may only be used within a single floor).
   8. Grounding: All fire alarm systems shall be grounded. The grounding shall be connected to the building's electrical grounding system. Refer to Building Design Standards 26 20 06.
   9. Network Riser cable shall have a two-hour fire-resistive rating. The A/E shall review the method to be used to achieve the rating with Facilities Operations and Development's - Technical Services Group.
   10. Final connection between equipment and the wiring system to be made under the direct supervision of a representative of the manufacturer.
   11. All wires shall be terminated with ring or split terminal crimp on connectors.
   12. All fire alarm system wiring shall be plenum rated.
   13. Firefighters two way communication, when required shall be by a Distributed Antenna System for Firefighter RF Radio System.
   14. Splicing of power and or/or control wiring and the use of wire nuts is prohibited.

15. Cable Taps: Use numbered screw terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made. Use split terminal crimp on connectors.
16. Wiring within enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams.
17. Network Access Control (NAC) Panels are to be wired as a circuit to the Fire Alarm Control Panel with 2-hour Fire Rated Cable.

3.03 MATERIALS AND WORKMANSHIP

A. All materials and equipment shall be new and unused and shall meet requirements of the latest Standards of NFPA, UL, NEMA, IPCEA, ANSI and IEEE. Equipment shall have components required or recommended by OSHA, applicable NFPA documents and shall be UL listed and labeled.

B. Despite references in the Specifications or on the drawings to materials or pieces of equipment by name, make or catalog number, such references shall be interpreted as establishing standards of quality for materials and performance.

C. Finish of materials, components and equipment shall not be less than industry good practice. When material or equipment is visible or subject to corrosive or atmospheric conditions, the finish shall be as approved by the A/E.

D. Provide proper access to material or equipment that requires inspection, replacement, repair or service. If proper access cannot be provided, confer with the Associate as to the best method of approach to minimize effects of reduced access.

E. The owner will not be responsible for material, equipment or the installation of same before testing and acceptance.

3.04 COORDINATION OF MAINTENANCE AND MONITORING

A. Provide the services of an authorized technical representative of the manufacturer of the equipment to supervise the installation, adjustment and all testing of the system required to assure a complete and fully operative facility in accordance with this specification and all State of Ohio Fire Marshal regulations. A signed test report substantiating this shall be submitted by the manufacturer.

B. It shall be the responsibility of the Electrical Contractor, where equipment or systems added under this Contract are found to be defective or not in accordance with the manufacturer's published data, the specification and/or Contract Drawings, to correct all discrepancies. It shall further be the responsibility of the Electrical Contractor to perform all retests and indicate to the owner, the State of Ohio Fire Marshal regulations and the A/E that all systems perform as required by the Contract Drawings and specifications. Retests shall

be performed in accordance with the city's requirements and at a time which is acceptable to the owner and all costs for retesting and operational retesting shall be borne by the Electrical Contractor. The Electrical Contractor shall notify the architect and A/E (7) days in advance of the date when the system will be ready for retesting.

3.05 MANUFACTURER'S CERTIFICATION

A. The qualified, factory trained authorized representative of the manufacturer shall provide on-site supervision of the fire alarm system installation. The representative shall certify, in writing, that the system and equipment has been installed, adjusted, and tested in accordance with the manufacturer's recommendations.

B. The Electrical Contractor shall provide three (3) copies of the manufacturer's representative's certification before final payment is made.

3.06 FIELD ACCEPTANCE TESTS

A. The owner shall not be responsible for fire alarm system material or equipment prior to testing and acceptance.

B. Before final approval and acceptance by the owner, fire protection and life safety systems shall be subjected to tests specified in any applicable NFPA Codes and Standards. Tests shall be witnessed by the representative of the State of Ohio Fire Marshall and the owner's Emergency Management & Fire Prevention and their designated representatives, Robert Armstrong. Piping, wiring and accessory devices in any portion of new system shall not be covered up or concealed permanently until they have been tested and approved. At least 48 hours notice shall be given to aforementioned representatives before test. In addition, "As-Built" Drawings including control, fire risers, etc., shall be on AutoCAD and shall be submitted to the owner at substantial completion of the project and before final payment shall be made by the owner.

C. Test shall comprise activating and verifying the operations of each and every device (input and output) and auxiliary functions. No exceptions to this requirement will be accepted. A written test log of this complete test shall be submitted prior to acceptance of the system by the owner. Prior to installation of ceiling pads, the system shall be tested in the presence of an Facilities Operations and Developments Fire Alarm Shop representative to verify the system is free of trouble signals.

D. Manual and Automatic Fire Alarm Systems

1. Upon completion of system or part as determined by the owner, satisfactory acceptance test of entire installation shall be made. Test shall include central control station, (i.e. the proprietary protective signaling system), and manual and automatic fire alarm systems. Test(s) shall include but shall not be limited to the following: Manual pull stations, evacuation signals/lights, thermal and/or smoke detectors, automatic door

release devices, waterflow and supervisory alarm devices, and elevator capture and recall.

E. To assure that wire size, power supply, number of devices on a circuit, etc., are suitable to support 100 percent of devices being in alarm or operated simultaneously, this test shall include the following:
   1. Place all sensors and monitor modules in alarm. Each shall display its address and alarm condition. At least the first ten (10) devices on each circuit shall also have their alarm LED's lighted.
   2. Operate all control modules for the alarm or operated condition. Each module shall display its address and condition.
   3. Reset all alarmed and operated devices. The panel shall display the address of any off-normal devices.

F. Test each sensor for trouble by removing the sensor from its base. The address and trouble condition for each shall be displayed. Insert a different type of sensor into the base. The address and trouble condition shall be displayed. The sensor will return to normal only when the proper sensor type is reinserted in the base.

G. Print out the English language descriptor and status of each module in the system. The printout shall also include the date and time.

H. Audible sound level measurements shall be conducted throughout the entire building and all spaces with the evacuation system sounding. Measurements shall be recorded in the following format for each space:

"Room/Area"	"Ambient Sound Level db"	"Ambient And Evacuation Sound Level dB"

These measurements shall be done to certify that all areas conform to the State of Ohio Fire Marshal regulations sound level requirements for evacuation alarm signals.

3.07 TRAINING

A. For daily operation, one full instructor-day, 8 hours minimum, divided into two 4-hour training modules covering the same instruction, of on-site instruction for the daily operation of the system, to be attended by the designated personnel. A training session shall be presented by a fully qualified, trained representative of the equipment manufacturer who is thoroughly knowledgeable of the specific installation.

3.08 ADDITIONAL SUPPORT DURING WARRANTY

A. Provide a full 1-year part and labor warranty for the entire system including batteries.

3.09 ANNUAL INSPECTIONS

A. The system, devices and applications, along with OEM training of the personnel, shall allow the owner to perform the "One Person Walk Tests" by area, location, device, address or system. The tests shall include:

1. Full system.
2. Area.
3. Trouble/alarm.
4. Silent/audible modes.
5. Provide record of all tests.
6. Audible appliance type and identification.
7. Auto "timed-out" with warnings.

END OF SECTION