Pittsburg State University

AXE LIBRARY

Phase I Renovation

A - 012950

Building number #38500-0019

PITTSBURG, KANSAS

MARCH 09, 2016

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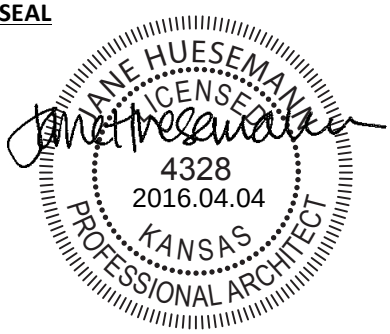
1.1 DESIGN PROFESSIONALS OF RECORD

ARCHITECT'S PROFESSIONAL SEAL



A. ARCHITECT:
   1. Jane Huesemann, AIA, Clark Huesemann LC.
   2. State of Kansas license # 4328.
   3. Responsible for Specification Divisions 01-12
   4. Responsible for Drawing Sheets: TS, G1.1, G1.2, D1.1, A1.1, A1.2, A4.1

PART 1 - DOCUMENT 000107 - SEALS PAGE

1.1 DESIGN PROFESSIONALS OF RECORD

MECHANICAL & ELECTRICAL ENGINEER'S PROFESSIONAL SEAL

A. Mechanical & Electrical Engineer:
   1. William R. Bassette, PE, Latimer, Sommers & Associates.
   2. State of Kansas license # 10530.
   3. Responsible for Specification Divisions 23 - 28
   4. Responsible for Drawing Sheets: ME1-1, ME2-1, M1-1, M1-2, M2-1, M2-2, M2-3, M3-1, M3-2, E1-1, E1-2, E2-1, E3-1, FA1-1, T1-1.

DOCUMENT 000115 - LIST OF DRAWING SHEETS

1.1 LIST OF DRAWINGS

A. Drawings: Drawings consist of the Contract Drawings and other drawings listed on the Table of Contents page of the separately bound drawing set titled Axe Library Phase 1 Renovation.

B. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of type indicated:

1. GENERAL INFORMATION
   TS – COVER
   G1.1 – GENERAL INFORMATION, SCHEDULES AND DETAILS
   G1.2 – CODE NARRATIVE AND CODE PLAN

2. ARCHITECTURAL
   D1.1 – DEMOLITION PLAN
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3. MECHANICAL, ELECTRICAL AND PLUMBING
   ME1.1 – PARTIAL BASEMENT PLAN – DEMOLITION
   ME2.1 – MECHANICAL AND ELECTRICAL DETAILS
   M1.1 – PARTIAL BASEMENT PLAN – HVAC
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   M2.3 – PARTIAL BASEMENT PLAN - HVAC PIPING
   M3.1 – MECHANICAL DETAILS
   M3.2 – MECHANICAL SCHEDULES
   E1.1 – PARTIAL BASEMENT PLAN - POWER
   E1.2 – PARTIAL BASEMENT PLAN - POWER
   E2.1 – PARTIAL BASEMENT PLAN - LIGHTING
   E3.1 – ELECTRICAL DETAILS AND SCHEDULES
   FA1.1 – PARTIAL BASEMENT PLAN - FIRE ALARM
   T1.1 – PARTIAL BASEMENT PLAN - TELECOM

END OF DOCUMENT 000115

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Project information.
2. Work covered by Contract Documents.
3. Work by Owner.
4. Work under separate contracts.
5. Purchase contracts.
6. Access to site.
7. Work restrictions.
8. Specification and drawing conventions.

1.3 PROJECT INFORMATION

A. Project Identification: Pittsburg State University, Axe Library Phase I, Project Number: A-012950

B. Owner: Pittsburg State University
1. Owner's Representative: Paul Stewart

C. Architect: Clark Huesemann, 927 1/2 Massachusetts Street, Lawrence, Kansas 66044.

D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:
1. MEP Engineer: Latimer, Sommers & Associates

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:
1. The interior renovation includes demolition of existing drywall and metal stud walls, acoustic ceilings, carpet, shelving, and mep items. New work includes installation of new drywall and metal stud walls, aluminum and hollow metal doors and frames, acoustic and drywall ceilings, lighting, and hvac systems, fire alarm, painting, carpet tile and accessories.

B. Type of Contract:
1. Project will be constructed under a single prime contract.

1.5 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated. Where indicated in the Drawings, the Work includes installing Owner-furnished products.
   1. The Owner will furnish the paint for the project.
   2. The Owner will furnish electrical panelboards for the project.

1.6 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to work in areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
   1. Limits: As indicated on drawings.
   2. Driveways, Walkways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
      a. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
      b. Coordinate with Owner for approval of any periods of time where the street will be blocked by deliveries or other work.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weather tight condition throughout construction period. Repair any and all damage caused by construction operations, including staging area, to same condition as existed prior to construction activities. Photographic documentation of existing conditions prior to commencement of construction activities is required.

1.7 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.
   1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. Work Sequence: Work will be phased as indicated on drawings
   1. Coordinate with Owner for scheduling of relocation activities.

C. On-Site Work Hours:
   1. Coordinate construction activities to limit disturbance of building occupants on floors above the area of work.
   2. Hours for Utility Shutdowns: Coordinate with the Owners schedule(s).

D. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
   1. Notify Architect and Owner not less than two days in advance of proposed utility interruptions.
   2. Obtain Architect's written permission before proceeding with utility interruptions.

E. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Architect and Owner not less than two days in advance of proposed disruptive operations.
2. Obtain Architect's written permission before proceeding with disruptive operations.

F. Nonsmoking Building and Site: PSU is a Tobacco Free campus.

G. Controlled Substances: Use of tobacco products and other controlled substances within the existing building or on Project site is not permitted.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.

g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.7 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Requested substitution provides sustainable design characteristics that specified product provided for compliance with LEED requirements.
c. Substitution request is fully documented and properly submitted.
d. Requested substitution will not adversely affect Contractor's construction schedule.
e. Requested substitution has received necessary approvals of authorities having jurisdiction.
f. Requested substitution is compatible with other portions of the Work.
g. Requested substitution has been coordinated with other portions of the Work.
h. Requested substitution provides specified warranty.
i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. 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.

1.5 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for fire protection, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

C. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Submit before Work begins.

D. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

E. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.6 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.7 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.8 FIELD CONDITIONS

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

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

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

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

C. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.
1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.3 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least **8** hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area on-site.
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by 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.

3.4 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

3.6 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Closet and utility shelving.

1.3 COORDINATION

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

1.4 ACTION SUBMITTALS

A. Shop Drawings: For interior architectural woodwork.

   1. Include plans, elevations, sections, and attachment details.
   2. Show large-scale details.
   3. Show locations and sizes of furring, blocking, and hanging strips, including blocking and reinforcement concealed by construction and specified in other Sections.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver interior architectural woodwork until painting and similar finish operations that might damage woodwork have been completed in installation areas. Store woodwork in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Field Measurements: Where interior architectural woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate

measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being concealed by construction, and indicate measurements on Shop Drawings.

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

PART 2 - PRODUCTS

2.1 INTERIOR ARCHITECTURAL WOODWORK, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

2.2 CLOSET AND UTILITY SHELVING

A. Grade: Premium.

B. Shelf Material: 3/4-inch (19-mm) plastic laminate-faced panel product with 3mm edge banding.

C. Standards and Brackets: Surface-mounted adjustable shelf standards and brackets as indicated on drawings.

2.3 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of interior architectural woodwork and quality grade specified unless otherwise indicated.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of interior architectural woodwork and quality grade specified unless otherwise indicated.
1. Composite Wood Products: Products shall be made without urea formaldehyde.
2. MDF: ANSI A208.2, Grade 130.
3. Particleboard: ANSI A208.1, Grade M-2.
4. Softwood Plywood: DOC PS 1, medium-density overlay.
5. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Nailers: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

B. Provide self-drilling screws for metal-framing supports, as recommended by metal-framing manufacturer.

C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

D. Adhesives: Do not use adhesives that contain urea formaldehyde.

E. Installation Adhesive: Product recommended by fabricator for each substrate for secure anchorage.

1. Adhesives shall have a VOC content of 70 g/L or less.

2.5 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate interior architectural woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Edges of Solid-Wood (Lumber) Members: 1/16 inch (1.5 mm) unless otherwise indicated.
2. Edges of Rails and Similar Members More Than 3/4 Inch (19 mm) Thick: 1/8 inch (3 mm).

C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times interior architectural woodwork fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that parts fit as intended and check measurements of assemblies against field measurements indicated on approved Shop Drawings before disassembling for shipment.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition interior architectural woodwork to average prevailing humidity conditions in installation areas.

B. Before installing interior architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install interior architectural woodwork to comply with same grade as item to be installed.

B. Assemble interior architectural woodwork and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Install interior architectural woodwork level, plumb, true in line, and without distortion. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

D. Scribe and cut interior architectural woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor interior architectural woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails for exposed fastening, countersunk and filled flush with interior architectural woodwork.

1. For shop-finished items, use filler matching finish of items being installed.

F. Touch up finishing work specified in this Section after installation of interior architectural woodwork. Fill nail holes with matching filler where exposed.

1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are shop applied.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective interior architectural woodwork, where possible, to eliminate functional and visual defects. Where not possible to repair, replace interior architectural woodwork. Adjust joinery for uniform appearance.

B. Clean interior architectural woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064023

SECTION 081213 - HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes hollow-metal work.

B. Related Requirements:
1. Section 087111 "Door Hardware (Descriptive Specification)" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, and finishes.

B. Shop Drawings: Include the following:
1. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
2. Locations of reinforcement and preparations for hardware.
3. Details of each different wall opening condition.
4. Details of anchorages, joints, field splices, and connections.
5. Details of accessories.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 INTERIOR DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Commercial Doors and Frames: NAAMM-HMMA 861. At locations indicated in the Door and Frame Schedule.

1. Physical Performance: Level A according to SDI A250.4.

2. Frames:
   a. Materials: Uncoated steel sheet, minimum thickness of [**0.053 inch (1.3 mm)**] [**0.067 inch (1.7 mm)**].
   b. Construction: Full profile welded.

3. Exposed Finish: Prime.

2.2 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.3 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.

H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

2.4 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
2. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
3. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
4. Jamb Anchors: Provide number and spacing of anchors as follows:

a. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

1) Three anchors per jamb up to 60 inches (1524 mm) high.
2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.

b. Compression Type: Not less than two anchors in each frame.
c. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.

5. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

C. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

D. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

2.5 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

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

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install frames with removable stops located on secure side of opening.
    d. Install door silencers in frames before grouting.
    e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

    a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
8. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing flush wood doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.

C. Samples for Initial Selection: For factory-finished doors.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.7 WARRANTY

A. A. Special Warranty: 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 (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Algoma Hardwoods, Inc.
2. Eggers Industries.
3. Graham Wood Doors; ASSA ABLOY Group company.
4. Marshfield DoorSystems, Inc.
5. Mohawk Flush Doors, Inc.

B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."

1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.

B. Adhesives: Do not use adhesives that contain urea formaldehyde.

C. Composite Wood Products: Products shall be made without urea formaldehyde.

D. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

E. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.

a. Screw Withdrawal, Face: 700 lbf (3100 N).
b. Screw Withdrawal, Edge: 400 lbf (1780 N).

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade AA faces.
2. Species: Select white maple.
3. Cut: Quarter sliced.
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Center-balance match.
6. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
7. Exposed Vertical Edges: Same species as faces - edge Type A.
8. Core: Structural composite lumber.
9. Construction: Seven plies, either bonded or nonbonded construction.

2.4 LIGHT FRAMES AND LOUVERS

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Flush rectangular beads.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished.

2.6 FACTORY FINISHING

A. 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.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.

B. Factory finish doors.

C. Transparent Finish:

1. Grade: Premium.
2. Staining: As selected by Architect from manufacturer's full range.
3. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

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

3.2 INSTALLATION

A. Hardware: For installation, see Section 087111 "Door Hardware (Descriptive Specification)."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.
   a. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Interior storefront framing.

B. Related Requirements:

1. Section 084226 "All-Glass Entrances " for entrance doors installed in Interior storefront framing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency.

C. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.

D. Source quality-control reports.

E. Field quality-control reports.

F. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration created by wind and thermal and structural movements.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Failure of operating components.

2. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.
e. Failure of operating units.

2.2 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Oldcastle BuildingEnvelope™ ; Non-Thermal Storefronts or a comparable product by one of the following:

1. EFCO Corporation.
2. Kawneer North America; an Alcoa company.
3. Manko Window Systems, Inc.
4. Trulite Glass & Aluminum Solutions, LLC.
5. U.S. Aluminum; a brand of C.R. Laurence.

B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

2.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Nonthermal.
2. Glazing System: Retained mechanically with gaskets on four sides.

3. Glazing Plane: Front.
4. Finish: Clear anodic finish.
5. Fabrication Method: Field-fabricated stick system.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Materials:

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

a. Sheet and Plate: ASTM B 209 (ASTM B 209M).
b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
d. Structural Profiles: ASTM B 308/B 308M.

2.4 GLAZING

A. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

B. Glazing Sealants: As recommended by manufacturer.

2.5 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

2.6 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.

2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from interior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
1. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.

5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components plumb and true in alignment with established lines and grades.

D. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
1. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
3. Alignment:

a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).

4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

END OF SECTION 084113

SECTION 084226 - ALL-GLASS ENTRANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Interior swinging all-glass entrance doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for all-glass system.

B. Shop Drawings: For all-glass entrances.

1. Include plans, elevations, and sections.
2. Include details of fittings and glazing, including isometric drawings of patch fittings.
3. Door hardware locations, mounting heights, and installation requirements.

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

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For all-glass systems, for tests performed by manufacturer and witnessed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For all-glass systems to include in maintenance manuals.

1.6 QUALITY ASSURANCE

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

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of all-glass systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
b. Failure of operating components.

2. Warranty Period: Two years from date of Substantial Completion

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of all-glass entrances representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

2.2 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Oldcastle BuildingEnvelope™ ; All Glass Entrance Systems or a comparable product by one of the following:

1. Avanti Systems, Inc.
2. Blumcraft of Pittsburgh; C.R. Laurence Co, Inc.
3. DORMA USA, Inc.
4. Trulite Glass & Aluminum Solutions, LLC.

2.3 METAL COMPONENTS

A. Fitting Configuration:

1. Manual-Swinging, All-Glass Entrance Doors: Patch fittings at head and sill on pivot side only.

B. Patch Fittings: Aluminum.

C. Accessory Fittings: Match patch-fitting metal and finish for the following:

1. Overhead doorstop.
2. Center-housing lock.
3. Glass-support-fin brackets.

D. Anchors and Fastenings: Concealed.

E. Materials:

1. Aluminum: ASTM B 221 (ASTM B 221M), with strength and durability characteristics of not less than Alloy 6063-T5.

a. Color: Clear Anodized.

2.4 GLASS

A. Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent), tested for surface and edge compression per ASTM C 1048 and for impact strength per 16 CFR 1201 for Category II materials.

1. Class 1: Clear monolithic.

a. Thickness: 1/2 inch (13 mm).
b. Locations: As indicated.

2. Exposed Edges: Machine ground and flat polished.

2.5 ENTRANCE DOOR HARDWARE

A. General: Heavy-duty entrance door hardware units in sizes, quantities, and types recommended by manufacturer for all-glass entrance systems indicated. For exposed parts, match metal and finish of patch fittings.

B. Concealed Floor Closers and Top Pivots: Center hung; BHMA A156.4, Grade 1; including cases, bottom arms, top walking beam pivots, plates, and accessories required for complete installation.

1. Swing: Single acting.

a. Positive Dead Stop: Coordinated with hold-open angle if any, or at angle selected.

2. Hold Open: None.

3. Opening-Force Requirements:
   a. Not more than 5 lbf (22.2 N) to fully open door.

C. Push-Pull Set: As selected from manufacturer's full range.

D. Single-Door and Active-Leaf Locksets: Center-housing combination deadbolt and latchbolt with lever handles.

1. Deadbolt operated by key outside and thumb turn inside.

E. Cylinders: As specified in Section 087111 "Door Hardware (Descriptive Specification)."

2.6 FABRICATION

A. Provide holes and cutouts in glass to receive hardware, fittings, and accessory fittings before tempering glass. Do not cut, drill, or make other alterations to glass after tempering.

1. Fully temper glass using horizontal (roller-hearth) process, and fabricate so that when glass is installed, roll-wave distortion is parallel with bottom edge of door or lite.

B. Factory assemble components and factory install hardware and fittings to greatest extent possible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Install all-glass systems and associated components according to manufacturer's written instructions.

B. Set units level, plumb, and true to line, with uniform joints.

C. Maintain uniform clearances between adjacent components.

D. Lubricate hardware and other moving parts according to manufacturer's written instructions.

E. Set, seal, and grout floor closer cases as required to suit hardware and substrate indicated.

3.3 ADJUSTING AND CLEANING

A. Adjust all-glass entrance doors and hardware to produce smooth operation and tight fit at contact points and weather stripping.

1. For all-glass entrance doors accessible to people with disabilities, adjust closers to provide a three-second closer sweep period for doors to move from a 70-degree open position to 3 inches (75 mm) from the latch measured to the leading door edge.

B. Remove excess sealant and glazing compounds and dirt from surfaces.

END OF SECTION 084226

SECTION 087111 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Mechanical door hardware for the following:

a. Swinging doors.

2. Cylinders for door hardware specified in other Sections.

B. Related Requirements:
1. Section 084226 "All-Glass Entrances" for entrance door hardware, except cylinders.
2. Refer to PSU Carpentry Standards.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
2. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
3. Content: Include the following information:

a. Identification number, location, hand, fire rating, size, and material of each door and frame.
b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.

c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
d. Fastenings and other installation information.
e. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
f. Mounting locations for door hardware.
g. List of related door devices specified in other Sections for each door and frame.

C. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of door hardware to include in maintenance manuals.

B. Schedules: Final door hardware and keying schedule.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

C. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including excessive deflection, cracking, or breakage.
b. Faulty operation of doors and door hardware.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Three years from date of Substantial Completion unless otherwise indicated below:

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of door hardware from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

B. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the DOJ's "2010 ADA Standards for Accessible Design".

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
2. Comply with the following maximum opening-force requirements:

a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.

3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.
5. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

2.3 SCHEDULED DOOR HARDWARE

A. Provide products for each door that comply with requirements indicated in door hardware schedule.

1. Door hardware is scheduled on Drawings.

2.4 HINGES

A. 4 1/2 x 4 1/2 ball bearing, five knuckle, full-mortise template butt hinges.

B. Use three hinges per door.

C. Stanley FBB 179 for standard duty applications
1. Hager, McKinney and Bommer are accepted as equals

2.5 MECHANICAL LOCKS AND LATCHES

A. Best Access System 45H series by Stanley Security Solutions.

2.6 LOCK CYLINDERS

A. Best Access System by Stanley Security Solutions
1. 1E74 22 (C4)

2.7 SURFACE CLOSERS

A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

B. Standard Duty
1. Install all closers to doors with through bolt mounting
a. Norton 7500 Series
b. LCN 4010 Series

2.8 THRESHOLDS

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

2.9 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rating labels and as otherwise approved by Architect.

1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.

C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

2. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
3. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.10 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

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

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

B. Wood Doors: Comply with door and hardware manufacturers' written instructions.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's 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. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

D. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as directed by Owner.
2. Furnish permanent cores to Owner for installation.

E. Stops: Provide wall stops for doors unless other stops are indicated in door hardware schedule.

F. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

1. Do not notch perimeter gasketing to install other surface-applied hardware.

G. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

3.5 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

END OF SECTION 087111

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.
3. Grid suspension systems for gypsum board ceilings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.

B. Studs and Tracks: ASTM C 645. Use either steel studs and tracks or embossed steel studs and tracks.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

B. Hanger Attachments to Concrete:

1. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 AC193 AC58 or AC308 as appropriate for the substrate.

a. Uses: Securing hangers to structure.
b. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.

2. Power-Actuated Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.

D. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.
1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
2. Multilayer Application: 16 inches (406 mm) o.c. unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks 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 that penetrate 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. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.

a. Install two studs at each jamb unless otherwise indicated.
b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

E. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

F. Z-Shaped Furring Members:

1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced [**24 inches (610 mm)**] <**Insert dimension**> o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (305 mm) from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.5 INSTALLING CEILING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

    a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

    a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.

5. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.

B. Related Requirements:

1. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Board, Type X: ASTM C 1396/C 1396M.
1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
2. Shapes:

a. Cornerbead.
b. Bullnose bead.
c. LC-Bead: J-shaped; exposed long flange receives joint compound.
d. L-Bead: L-shaped; exposed long flange receives joint compound.
e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
f. Expansion (control) joint.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

D. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

E. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

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

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge

trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: 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 C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board as indicated on the Drawings:

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use as required.
3. L-Bead: Use as required.
4. U-Bead: Use as required.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

    a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

3. Level 5: At areas indicated to received Paint Colors P5, and P3.

    a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

3.6 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.

C. 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.

END OF SECTION 092900

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:

1. Acoustical Panels: Set of 6-inch- (150-mm-) square Samples of each type, color, pattern, and texture.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.

C. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, 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. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A according to ASTM E 1264.
2. Smoke-Developed Index: 450 or less.

2.3 ACOUSTICAL PANELS (ACT1)

A. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

B. Type: Armstrong Cortega, 769

C. Size: 2’ x 4’

D. Color: White.

E. Edge/Joint Detail: Square.

F. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273, ASTM D 3274, or ASTM G 21 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 ACOUSTICAL PANELS (ACT2)

A. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

B. Type: Armstrong Ultima, 1911

C. Size: 2’ x 2’

D. Color: White.

E. Edge/Joint Detail: Beveled Tegular.

F. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273, ASTM D 3274, or ASTM G 21 and evaluated according to ASTM D 3274 or ASTM G 21.

2.5 METAL SUSPENSION SYSTEMS

A. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.

B. Armstrong Prelude XL 15/16” Exposed T grid system for ACT 1

C. Armstrong Suprafine XL 9/16” Exposed T grid system for ACT 2

2.6 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

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

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.

B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

A. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
3. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
4. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
7. Do not attach hangers to steel deck tabs.
8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
9. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.

1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
2. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
3. 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.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Resilient base.
2. Resilient molding accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches (300 mm) long.

C. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches (300 mm) long.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.5 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flexco.
2. Johnsonite; a Tarkett company.
3. Roppe Corporation, USA.

B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

1. Style and Location:
   a. Cove: Provide in all indicated areas.

C. Thickness: 0.125 inch (3.2 mm).

D. Height: 4 inches (102 mm).

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed.

G. Inside Corners: Job formed.

H. Colors: As selected by Architect from full range of industry colors.
1. R1 to be selected in dark gray
2. R1 to be selected to match existing

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

C. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

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

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.

   a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.

   a. Cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
2. Tightly adhere to substrates throughout length of each piece.
3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Vinyl composition floor tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: Full-size units of each color and pattern of floor tile required.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

   1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient tile flooring, 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.

2.2 VINYL COMPOSITION FLOOR TILE

A. Tile Standard: ASTM F 1066, Class 1, solid-color tile.

B. Wearing Surface: Smooth.

C. Thickness: 0.125 inch (3.2 mm).

D. Size: 12 by 12 inches (305 by 305 mm).

E. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

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

3.2 PREPARATION

A. Prepare substrates according to floor tile 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. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within acceptable range.
4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations.

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 floor tiles until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain running in a basketweave pattern.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.

1. Apply three coat(s).

E. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes modular carpet tile.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for removing existing floor coverings.
2. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:

a. Review delivery, storage, and handling procedures.
b. Review ambient conditions and ventilation procedures.
c. Review subfloor preparation procedures.
d. Review transitions to other floor materials.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

B. Shop Drawings: For carpet tile installation, plans showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.

6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI's "CRI Carpet Installation Standard."

1.10 FIELD CONDITIONS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, the following:

a. More than 10 percent edge raveling, snags, and runs.
b. Dimensional instability.
c. Excess static discharge.
d. Loss of tuft-bind strength.
e. Loss of face fiber.
f. Delamination.

3. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Basis-of-Design Product: Subject to compliance with requirements, provide Interface, LLC; Monochrome or a comparable product by one of the following:

1. J&J Invision; J&J Industries, Inc.
2. Shaw Contract Group; a Berkshire Hathaway company.
3. Tandus; a Tarkett company.

B. Color: As selected by Architect from manufacturer's full range.

C. Pattern: Solid.

D. Fiber Content: 100 percent nylon 6.

E. Pile Characteristic: Tufted Textured Loop pile.

F. Backing System: GlasBac RE tile.

G. Size: 50cm x 50cm.

H. Applied Treatments:

1. Soil-Resistance Treatment: Protek2.
2. Antimicrobial Treatment: Intersept that protects carpet tiles as follows:

a. Antimicrobial Activity: No mold or bacteria growth when tested per the ASTM E2471 Standard Test Method.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

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

3.2 PREPARATION

A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer: Free lay; install carpet tiles without adhesive using TacTiles installation system.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns: Quarter Turn.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

H. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 099100 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This document is maintained on electronic media. The current revision is located on the PSU website at www.pittstate.edu. It is the responsibility of the user to ensure that any paper copies are of the latest revision. Architect and owner will have final say.

1.2 SUMMARY

A. Unless noted or specified otherwise paint and finish all exposed surfaces using the combination of materials listed on Painting Schedule in part 4 of this section, as specified herein, and as needed for a complete and proper installation.

B. Related Work:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and other Sections of these Specifications.
2. Priming or priming and finishing of certain surfaces may be specified to be factory-performed or installer-performed under pertinent other Sections.

C. Work not included:
1. Unless otherwise indicated, painting is not required on surfaces in concealed areas and inaccessible areas such as furred spaces, foundation spaces, utility tunnels, pipe spaces, and duct shafts.
2. Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze, and similar finished materials will not require painting under this Section except as may be so specified.
3. Do not paint moving parts of operating units; mechanical or electrical parts such as valve operators; linkages; sensing devices; and motor shafts, unless otherwise indicated.
4. Do not paint over required labels or equipment identification, performance rating, name, or nomenclature plates.
5. Do not paint concrete which has been sandblasted.

D. Definitions:
1. “Paint,” as used herein, means coating systems, materials including primers, emulsions, epoxy, enamels, sealers, fillers, and other applied materials whether used as prime, intermediate, or finish coats.

1.3 SUBMITTALS

A. Comply with pertinent provision for the Specification.

B. Product data: The Contractor shall Submit: For each paint system indicated, including:
1. Material List: An inclusive list of required coating material. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by

manufacturer's catalog number and general classification. Apply coats on Samples in steps to show each coat required for system.

2. Preparation instructions and recommendations.
3. Manufacturer's information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material (MSDS & PDS).

C. Samples:
1. Following the selection of colors and glosses by the Architect, submit Samples for the Architect's review.
a. If so directed by the Architect, submit Samples during progress of the work in the form of actual application of the approved materials on actual surfaces to be painted
2. Revise and resubmit each Sample as requested until the required gloss, color, and texture are achieved. Such Samples, when approved, will become standards of color and finish for accepting or rejection the work of this Section.
3. Do not commence finish painting until approved Samples are on file at the job site.

1.4 QUALITY ASSURANCE

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

B. Paint coordination:
1. Provide finish coats which are compatible with the prime coats actually used.
2. Review other Sections of these Specifications as required, verifying the primer coats to be used and assuring compatibility of the total coating system for the various substrates.
3. Furnish information on the characteristics of the specific finish materials to assure that compatible primer coats are used.
4. Provide barrier coats over non-compatible primers, or remove the primer and re-prime as required.
5. Notify the Architect in writing of anticipated problems in using the specified coating system over prime-coatings supplied under other Sections.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label:

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain storage containers in a clean condition, free of foreign materials and residue.

1.6 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F (10 and 32 deg C).

C. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F (7 and 35 deg C).

D. Do not apply paint in snow, rain, fog, or mist, or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. At beginning of the job deliver to owner one container of each type and color of paint used for draw downs. Properly labeled with color (formula for custom mixed colors). Minimum one gallon container is required with five gallon maximum.

B. Deliver to paint shop 104 Hartman hall.

C. Include Room finish Schedule with paint.

D. Include MSDS for all materials delivered.

PART 2 - PRODUCTS

2.1 MANUFACTURERS (For all Paints Except P5)

A. Acceptable Manufacturer: PPG Architectural Finishes Inc.; One PPG Place, Pittsburgh, PA 15272. ASD Tel: (888) 774-7732. Fax: (888) 434-3127. Email: ppgspec@ppg.com Web: www.pittsburghpaints.com

B. Substitutions: Equal products of other manufactures approved in advance by the Architect and owner.

C. OWNER WILL PROVIDE PAINT MATERIALS. PAINT MATERIALS LISTED ARE FOR REFERENCE TO THE PREP WORK AND NUMBER OF COATS REQUIRED. Painter is responsible for materials needed for prep, application and cleanup.

2.2 PAINT MATERIALS - GENERAL

A. Materials Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. VOC Classification: Provide high-performance coating materials, including primers, undercoats, and finish coat materials that have a VOC classification of 450 g/l or less.

2.3 COLOR SCHEDULES

A. Based on the Finish Schedule included in the drawings, provide the following paint colors:

1. P1 (red): PPG1187-7 Red Gumball
2. P2 (dark gray): PPG1011-5 Improbable
3. P3 (white): PPG1001-1 Delicate White
4. P4 (light gray): PPG1010-3 Soltice
5. P6 (match existing walls): TBD, Contractor to provide suggested match for Review by Architect.

2.4 PAINT P5 (GREEN SCREEN CHROMA KEY PAINT)

A. At locations indicated on Finish Schedule provide the following paint:
   1. Professional Grade Chroma Key Paint (green), provided by Rosco or ProCyc as follows:
      a. Apply required primer as recommended by Manufacturer.
      b. Apply chroma key paint in methods and coats as recommended by Manufacturer.
      c. Utilize application methods recommended by Manufacturer.

2.5 APPLICATION EQUIPMENT

A. For application of the approved paint, use only such equipment as is recommended for application of the particular paint by the manufacturer of the particular paint, and as approved by the Architect.

B. Prior to use of application equipment, verify that the proposed equipment is actually compatible with the materials to be applied, and that integrity of the finish will not be jeopardized by use of the proposed equipment.

2.6 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

B. Some projects may require special finishes as directed by architect and owner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.

C. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
   1. Notify Architect in writing, about anticipated problems when using the materials specified over substrates primed by others.
   2. If a potential incompatibility of primers applied by others exists, obtain the following from the primer applicator before proceeding:
      a. Confirmation of primer’s suitability for expected service conditions.

b. Confirmation of primer's ability to be top coated with materials specified.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.

B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
1. After completing painting operation in each space or area, reinstall items removed using workers skilled in the trades involved.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
1. Provide barrier coats over incompatible primers or remove and re-prime.
2. Provide barrier coats over incompatible primers or remove primers and re-prime substrate.
3. Cementitious Substrates: Prepare concrete, brick, concrete masonry block, and cement plaster surfaces to be coated. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods to prepare surfaces.
   a. Use abrasive blast-cleaning methods if recommended by coating manufacturer.
   b. Determine alkalinity and moisture content of surfaces by performing appropriate test. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not coat surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
4. Wood Substrates: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Smoothly sand surfaces exposed to view and dust off.
   a. Scrape and clean small, dry seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer, before applying primer.
   b. Immediately on delivery, prime edges, ends, faces, undersides, and backsides of wood to be coated.
   c. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
   d. Unless specifically approved by Architect, do not proceed with painting of wood surfaces until moisture content of the wood is 12% or less as measured by a moisture meter approved by the Architect.
5. Ferrous-Metal Substrates: Clean un-galvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC recommendations.
   a. Blast-clean steel surfaces as recommended by coating manufacturer and according to SSPC-SP 10
   b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
   c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire brush, solvent clean, and touch up with same primer as the shop coat.
6. Nonferrous Metal Substrates: Clean nonferrous and galvanized surfaces according to manufacturer's written instruction for the type of service, metal substrate, and application required.

a. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Material Preparation: Carefully mix and prepare coating materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying coating in a clean condition, free of foreign materials and residue.
2. Stir material before applying to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into the material. Remove film and, if necessary, strain coating material before using
3. Use only the type of thinners approved by manufacturer and only within recommended limits.
4. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Touch up on applied prime coats which have been damaged, and touch up bare areas prior to start of finish coats application.
2. Slightly vary the color of succeeding coats.
a. Do not apply additional coats until the completed coat has been inspected and approved.
b. Only the inspected and approved coats of paint will be considered in determining the number of coats applied.
3. Sand and dust between coats to remove defects visible to the unaided eye from a distance of five feet.
4. On removable panels and hinged panels, paint the back sides to match the exposed sides.

B. General: Apply high-performance coating according to manufacturer's written instructions.
1. Use applicators and techniques best suited for the material being applied.
2. Do not apply high-performance coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.
3. Coating surface treatments and finishes are indicated in the coating system descriptions.
4. Provide finish coats compatible with primers used.
5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector cover, grilles, covers for finned-tub radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.

C. Application Procedures: Apply coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. The number of coats and film thickness required is the same regardless of application method.
2. Block filler on new concrete masonry units is to be applied by roller and not spray applied for proper coverage. Insure all pours are filled before finish coat is applied.

D. Drying:
1. Allow sufficient drying time between coats, modifying the period as recommended by the material manufacturer to suit adverse weather conditions.

2. Consider oil-base and oleo-resinous solvent-type paint as dry for recoating when the paint feels firm, does not deform or feel sticky under moderate pressure of the thumb, and when the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

E. Brush applications:
1. Brush out and work the brush coats into the surface to an even film.
2. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, and other surface imperfections will note be acceptable.

F. Spray applications:
1. Except as specifically otherwise approved by the Architect, confine spray application to metal framework and similar surfaces where brush work would be inferior
2. Where spray application is used, apply each coat to provide the hiding equivalent of brush coats.
3. Do not double back with spray equipment to build up film thickness of two coats in one pass.

G. Completed work: Match the approved Samples as to texture, color, and coverage. Remove, refinish, or repaint, work not in compliance with the specified requirements.

H. Miscellaneous surfaces and procedures:
1. Exposed mechanical items;
   a. Finish electric panels, access doors, conduits, pipes, ducts, grilles, registers, vents, and items of similar nature to match the adjacent wall and ceiling surfaces, or as directed by the Architect.
2. Interior: Use “smooth” finish where enamel is specified.
3. Exposed vents: Apply two coats of heat-resistant paint approved by the Architect.

3.4 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:
1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the present of Contractor.
2. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove non-complying paint from Project site, pay for testing, and repaint surfaces previously coated with the non-complying paint. If necessary, contractor may be required to remove non-complying paint from previously painted surfaces if, on repainting with specified paint, the two coating are incompatible.

3.5 CLEAN-UP

A. At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

B. Upon completion of painting, clean glass and paint spattered surfaces. Remove spattered paint by washing, scraping or other proper methods, and using care not to scratch or damage adjacent finished surfaces.

C. Correct damaged by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 PROTECTION

A. Protect work of other trades, whether to be painted or not, against damage from painting.

B. Provide “Wet Paint” signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.

C. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces.

PART 4 - COATING SYSTEMS

4.1 INTERIOR PAINT SYSTEMS

A. Concrete and Masonry (Other Than Concrete Unit Masonry): Provide the following paint systems over interior concrete and brick masonry substrates:
   1. Two finish coats over a primer.
      a. Preparation: Allow concrete and masonry to cure for thirty (30) days under normal drying conditions. Remove all dirt, dust, grime, loose mortar and all other forms of contamination.
      b. Primer: 4-603 Pittsburgh Paints: Interior/Exterior Alkali Resistant primer. Applied at a dry film thickness of not less than 1.2 mils (0.030 mm)
      c. Finish: 6-8510 Pittsburgh Paints: Speed Hide Interior high luster semi gloss acrylic enamel: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).
      d. Finish: 6-411 Pittsburg Paint: SpeedHide interior Enamel Latex Eggshell. Applied at a dry film thickness of not less than 1.0 mil (0.025 mm)

B. Existing Concrete and Masonry (prefinished) (Other Than Concrete Unit Masonry): Provide the following paint systems over interior concrete and brick masonry substrates:
   1. Two finish coats over a primer.
      a. Preparation: Lightly sand existing paint to a dull finish. Remove all dirt, dust, grime, loose mortar and all other forms of contamination.
      b. Primer: 17-921 Pittsburg Paints: Seal Grip Interior/Exterior Acrylic primer. Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
      c. Finish: 6-8510 Pittsburgh Paints: Speed Hide Interior high luster semi gloss acrylic enamel: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).
      d. Finish: 6-411 Pittsburg Paint: SpeedHide interior Enamel Latex Eggshell. Applied at a dry film thickness of not less than 1.0 mil (0.025 mm)

C. Concrete Unit Masonry: Provide the following finish systems over interior concrete masonry:
   1. Two finish coats over block filler and a prime coat.
      a. Preparation: Allow mortar to cure for thirty (30) days under normal drying conditions. Remove all dirt, dust, grime, loose mortar and all other forms of contamination.
      b. Block Filler: 6-15 Pittsburgh Paints; Speed Hide interior/exterior Masonry latex Block Filler. Applied at a dry film thickness of not less than 6.0 to 12.5 mils (0.152 to 0.318 mm). To be applied by roller only not sprayed and back rolled. Insure all pours are filled before applying primer coat.

c. Primer: 4-603 Pittsburgh Paints: Interior/Exterior Alkali Resistant primer. Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
d. Finish: 6-8510 Pittsburgh Paints; Speed Hide Interior high luster semi gloss acrylic enamel: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).

OR

e. Finish: 6-411 Pittsburg Paint: SpeedHide interior Enamel Latex Eggshell. Applied at a dry film thickness of not less than 1.0 mil (0.025 mm)

D. Existing Concrete Unit Masonry: (prefinished) Provide the following finish systems over interior concrete masonry:
1. Two finish coats over a primer.
a. Preparation: Lightly sand existing paint to a dull finish. Remove all dirt, dust, grime, loose mortar and all other forms of contamination.
b. Primer: 17-921 Pittsburgh Paints: Seal Grip Interior/Exterior Acrylic primer. Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
c. Finish: 6-8510 Pittsburgh Paints; Speed Hide Interior high luster semi gloss acrylic enamel: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).

E. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
1. Two finish coats over a primer.
a. Preparation: Remove all dirt, grime and all other forms of contamination.
b. Primer: 6-2 Pittsburg Paints: SpeedHide interior Quick-Drying latex sealer: Applied at a dry film thickness of not less than 1.0 mil (1.025 mm)

OR

c. Primer: 6-1 Pittsburgh Paints: Speed Hide Interior Quick-Drying latex sealer: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).
d. Finish: 6-8510 Pittsburgh Paints; Speed Hide Interior high luster semi gloss acrylic enamel: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).

OR

e. Finish: 6-1110 Pittsburgh Paints; interior semi gloss alkyd enamel finish: Applied at a dry film thickness of not less than 1.4 mil (0.036 mm).

OR

f. Finish: 6-411 Pittsburg Paint: SpeedHide interior Enamel Latex Eggshell. Applied at a dry film thickness of not less than 1.0 mil (0.025 mm)

F. Existing Gypsum Board: Provide the following finish system over interior gypsum board surfaces:
1. Two finish coats over a primer.
a. Preparation: Lightly sand existing paint to a dull finish. Remove all dirt, grime and all other forms of contamination.
b. Primer: 17-921 Pittsburgh Paints: Seal Grip Interior/Exterior Acrylic primer. Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
c. Finish: 6-8510 Pittsburgh Paints; Speed Hide Interior high luster semi gloss acrylic enamel: Applied at a dry film thickness of note less than 1.0 mil (0.025 mm).

OR

d. Finish: 6-411 Pittsburgh Paints; SpeedHide interior Enamel Latex Eggshell. Applied at a dry film thickness of not less than 1.0 mil (0.025 mm)

OR

e. Finish: 6-1110 Pittsburgh Paints; interior semi gloss alkyd enamel finish: Applied at a dry film thickness of not less than 1.4 mil (0.036 mm).

G. Plaster: Provide the following finish system over new interior plaster surfaces:
1. Two finish coats over a primer.

a. Preparation: Make necessary repairs with appropriate material and remove all dirt, grime, loose mortar and all forms of contamination.
b. Primer: 4-603 Pittsburgh Paints: Interior/Exterior Alkali Resistant primer. Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
c. Finish: 6-8510 Pittsburgh Paints; Speed Hide Interior high luster semi gloss acrylic enamel: Applied at a dry film thickness of not less than 1.0 mil (0.025 mm).

OR

d. Finish: 6-411 Pittsburgh Paints; SpeedHide interior Enamel Latex Eggshell. Applied at a dry film thickness of not less than 1.0 mil (0.025 mm)

OR

e. Finish: 6-1110 Pittsburgh Paints; interior semi gloss alkyd enamel finish: Applied at a dry film thickness of not less than 1.4 mil (0.036 mm).

H. Existing and New, Wood and Hardboard: Provide the following paint finish systems over new interior wood surfaces with less than 12% moisture content as measured by a moisture meter approved by the Architect.
1. Two finish coats over a primer.
a. Preparation: Lightly sand with the grain of the wood, appropriately seal all knots and sap streaks, repair cracks and defects with the appropriate patching compounds.
b. Primer: 17-931 Pittsburg Paints: Seal Grip Stain Killing primer. Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
c. Finish: 6-1110 Pittsburgh Paints; interior semi gloss alkyd enamel finish: Applied at a dry film thickness of not less than 1.4 mil (0.036 mm).

I. New trim, cabinets, or wooden doors with clear finish: Provide the following finish systems over new interior wood trim with less than 12% moisture content as measured by a moisture meter approved by the Architect.
1. Two finish coats over one stain and one sealer.
a. Preparation: Lightly sand with the grain of the wood using progressing grits of sandpaper until a smooth surface free of defects is achieved. Stir thoroughly, but do not shake. Sand lightly with fine sandpaper between coats to insure a smooth finish. Do not use steel wool.
b. Apply one coat of Min Wax stain to color selected by Architect.
c. Sealer: Apply one coat Olympic; Premium Interior Oil Base Sanding Sealer #41060
d. Finish: Apply two coat Olympic; Premium Interior Fast Dry Varnish Gloss # 43888 or Satin 43887

J. Ferrous Metal: Provide the following finish system over ferrous metal:
1. Two finish coats over primer.
a. Preparation: Remove all loose mill scale, rust and corrosion deposits and any other forms of contamination.
b. Primer: 6-208 (red) or 6-212 (white) Pittsburgh Paints: Speed hide Interior/Exterior Rust Inhibitive Steel primer: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
c. Finish: Coronado Rust Scat 31 Line gloss or 651 Line Satin: Applied at a dry film thickness of not less than 1.4 mil (0.036 mm).

OR

d. Primer: Pittsburgh Paint (spot prime exposed bare metal); 97-145 Series Pittguard DTR Epoxy Mastic: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm)
e. Finish: Pittsburgh Paints; 95-812 Series Pitthane Ultra Gloss Urethane Enamel: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

K. Existing Ferrous Metal: Provide the following finish systems over ferrous metal:
1. Two finish coats over primer.
a. Preparation: Lightly sand existing paint to a dull finish. Spot prime bare metal. Remove all dirt, dust, grime and all other forms of contamination.
b. Primer: 6-208 (red) or 6-212 (white) Pittsburgh Paints: SpeedHide Interior/Exterior Rust Inhibitive Steel primer: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
c. Finish: Coronado Rust Scat 31 Line gloss or 651 Line Satin: Applied at a dry film thickness of not less than 1.4 mil (0.036 mm).

OR

d. Primer: 97-680 Series, Multi Prime; Low VOC Quick Dry Universal Primer. Applied at a dry film thickness of 3.0 to 4.0 mills.
e. Finish: 97-812 Series: Pitthane Ultra Gloss Urethane Enamel: Applied at a dry film thickness of not less than 20 mils (0.051 mm).

L. Zinc-Coated Metal: Provide the following finish systems over interior Zinc-coated metal surfaces:
1. Two finish coats over primer.
a. Preparation: Remove grease and oils with a quality pre-paint cleaning solution. If any oxidation has formed, thoroughly sand and remove all forms of contamination.
b. Primer: 6-204 Pittsburgh paints: Speed hide Interior/Exterior Zinc Chromate Metal primer: Applied at a dry film thickness of not less than 1.5 mils (0.050 mm).
c. Finish: Coronado Rust Scat 31 Line gloss or 651 Line Satin: Applied at a dry film thickness of not less than 1.4 mil (0.036 mm).

M. Existing Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces: (Prefinished)
1. Two finish coats over primer.
a. Preparation: Lightly sand existing paint to a dull finish. Spot prime bare metal. Remove all dirt, dust, grime and all other forms of contamination.
b. Primer: 17-931 Pittsburg Paints: Seal Grip Stain Killing primer. Applied at a dry film thickness of not less than 1.2 mils (0.030 mm). Finish: Coronado Rust Scat 31 Line gloss or 651 Line Satin: Applied at a dry film thickness of not less than 1.4 mil (0.036 mm).
c. Finish: Coronado Rust Scat 31 Line gloss or 651 Line Satin: Applied at a dry film thickness of not less than 1.4 mil (0.036 mm).

4.2 SHOP DRAWINGS

A. Information to be included: After project is completed; Delivered to, and gone over with the supervisor of the paint shop 104 Hartman Hall.
1. Copy of room finish schedule of paint actually used.
a. Include Manufacturer’s name for each paint used.
b. Manufacturer’s Product number for each paint used.
c. Color name and number for each paint used.
d. Formulas for custom mixed colors.
e. Location where paint was used.
f. Include MSDS for each product used.
g. One new unopened gallon of each paint used and labeled.

END OF SECTION 099123

SECTION 101100 - VISUAL DISPLAY UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Glass markerboards.

B. Related Requirements:

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of tackboards.

C. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For visual display units to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Field Measurements: Verify actual dimensions of construction contiguous with visual display units by field measurements before fabrication.

1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of visual display unit from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

2.3 GLASS MARKERBOARDS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Claridge Products and Equipment, Inc; MGMI Magnetic Glass Markerboard or a comparable product by one of the following:

1. A-1 Visual Systems.
2. Best-Rite; MooreCo, Inc.
3. Clarus Glassboards, LLC.
4. Egan Visual Inc.
5. Marsh Industries, Inc.

B. Glass Markerboards: 6-mm tempered glass markerboard, with smooth polished edge and eased corners; color coated on back surface.

C. Mounting: Invisi-mount, no visible hardware.

D. Color and Surface: Glossy white.

E. Marker Tray: none.

F. Size: 48 by 96 inches (1219 by 2438 mm).

2.4 GENERAL FINISH REQUIREMENTS

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

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

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine walls and partitions for proper preparation and backing for visual display units.

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

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.

C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.

3.3 INSTALLATION

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide

grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings, or if not indicated, at heights indicated below.
   1. Mounting Height: 36 inches (914 mm) above finished floor to bottom of markerboard.

3.4 CLEANING AND PROTECTION

A. Clean visual display units according to manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 101100

SECTION 101423.13 - ROOM-IDENTIFICATION SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes room-identification signs that are directly attached to the building.

B. Related Requirements:

1.3 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For room-identification signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.

C. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Room-Identification Signs: Full-size Sample.
2. Full-size Samples, if approved, will be returned to Contractor for use in Project.

D. Product Schedule: For room-identification signs. Use same designations indicated on Drawings or specified.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Deterioration of embedded graphic image.
c. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design".

2.2 ROOM-IDENTIFICATION SIGNS

A. Room-Identification Sign type A: This is a two part sign, with an aluminum section, and a frosted vinyl text area applied separately to the glazing. Refer to drawings. Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
1. Laminated-Sheet Sign: Clear Aluminum Laminate face sheet with raised graphics laminated to phenolic backing sheet to produce composite sheet.
a. Composite-Sheet Thickness: 0.25 inch (6.35 mm).
b. Raised graphics color: Black
c. Dimensions: per drawings.
2. Surface-Applied Graphics: Applied vinyl film .
a. Color(s): Dusted Crystal or similar color to simulate frosted glass.
b. Text: To be determined by Owner.
c. Location of Surface Applied Graphics: on Glass adjacent to Aluminum sign, as indicated on drawings.

3. Sign-Panel Perimeter: Finish edges smooth.

a. Edge Condition: Square cut.
b. Corner Condition in Elevation: Square.

4. Mounting: with two-face tape.
   a. Provide blank sign plate to match face sign plate, applied to opposite side of glass to conceal back and mounting tape.
      1) Align back plate with front sign plate.
   b. Location: per drawings.
5. Text and Typeface: Accessible raised characters and Braille typeface as selected by Architect from manufacturer's full range. Finish raised characters to contrast with background color, and finish Braille to match background color.

B. Room-Identification Sign type B: This is an aluminum plate sign applied to drywall wall locations. Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
1. Laminated-Sheet Sign: Clear Aluminum Laminate face sheet with raised graphics laminated to phenolic backing sheet to produce composite sheet.
   a. Composite-Sheet Thickness: 0.25 inch (6.35 mm).
   b. Raised graphics color: Black
   c. Dimensions: per drawings

2. Sign-Panel Perimeter: Finish edges smooth.
   a. Edge Condition: Square cut.
   b. Corner Condition in Elevation: Square.

3. Mounting: with two-face tape.
   a. Location: per drawings
4. Text and Typeface: Accessible raised characters and Braille typeface as selected by Architect from manufacturer's full range. Finish raised characters to contrast with background color, and finish Braille to match background color.

2.3 SIGN MATERIALS

A. Vinyl Film: UV-resistant vinyl film with pressure-sensitive, permanent adhesive; die cut to form characters or images as indicated on Drawings.

2.4 ACCESSORIES

A. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch (1.14 mm) thick, with adhesive on both sides.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.

2. Mill joints to a tight, hairline fit.

2.6 GENERAL FINISH REQUIREMENTS

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

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Accessibility: Install signs in locations on walls as indicated on Drawings and according to the accessibility standard.

C. Mounting Methods:
1. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

3.2 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101423.13

SECTION 123623.13 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes plastic-laminate countertops.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including panel products and high-pressure decorative laminate.

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

C. Samples for Verification:

1. Plastic laminates, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish, with one sample applied to core material and specified edge material applied to one edge.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of product.

1. Composite wood and agrifiber products.
2. High-pressure decorative laminate.
3. Chemical-resistant, high-pressure decorative laminate.
4. Adhesives.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver countertops until painting and similar operations that could damage countertops have been completed in installation areas. If countertops must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where countertops 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.

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

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.

B. Grade: Premium.

C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.

1. Provide products by the following manufacturer:
   a. Pionite

D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. Angel White SW826 Suede

E. Edge Treatment: 3mm edgeband in color to match surface.

F. Core Material: Medium-density fiberboard.

G. Core Thickness: 3/4 inch (19 mm).

1. Build up countertop thickness to 1-1/2 inches (38 mm) at front, back, and ends with additional layers of core material laminated to top.

H. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Composite Wood Products: Products shall be made without urea formaldehyde.
2. Medium-Density Fiberboard: ANSI A208.2, Grade 130 .

2.3 MISCELLANEOUS MATERIALS

A. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.4 FABRICATION

A. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.

B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install countertops to comply with same grade as item to be installed.

B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.

1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
2. Seal edges of cutouts by saturating with varnish.

C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches (150 mm) of front and back edges and at intervals not exceeding 24 inches (600 mm). Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

D. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).

E. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

F. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Secure backsplashes to walls with adhesive.
3. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean countertops on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 123623.13

SECTION 230500 - COMMON WORK RESULTS FOR MECHANICAL

PART 1 - GENERAL PROVISIONS

1.1 CONTRACT DOCUMENTS

A. All contract documents including drawings, alternates, addenda and modifications preceding this division of this specification are applicable to contractors, subcontractors, and material suppliers.

1.2 SPECIFICATION FORM AND DEFINITIONS

A. These Specifications are abbreviated form and contain incomplete sentences. Omissions of words or phrases such as "the contractor shall", "shall be", "as noted on the Drawings", "according to the drawings", "a", "an", "the" and "all" are intentional. Omitted words and phrases shall be supplied by inference.

B. The term “Engineer”, "Engineer", or “Engineer” wherever used in these specifications, shall mean LATIMER, SOMMERS & ASSOCIATES, P.A., 3639 SW SUMMERFIELD DRIVE, SUITE A, TOPEKA, KANSAS 66614, PHONE 785-233-3232, FAX 785-233-0647.

C. Contractor, wherever used in these specifications, shall mean the Company that enters into contract with Owner to perform this work.

D. When a word, such as "proper", "satisfactory", "equivalent", and "as directed", is used, it requires Engineer's review.

E. "Provide" means furnish and install.

F. Engineer hereinafter abbreviated A/E shall mean both the Design Engineers and the Design Engineers.

G. Equipment and/or materials manufacturer hereinafter abbreviated E/M shall mean the manufacturer of equipment or materials specified or referred to.

H. When the term “equivalent” is used in context to products or manufacturer’s, the equivalency of the proposed product or manufacturer to be used in lieu of the specified product or manufacturer is the sole decision of the A/E.

1.3 SUPERVISION

A. The contractor shall employ an experienced, competent and adequate work force licensed in their specific trade and properly supervised at all times.

B. Unlicensed workers and general laborers shall be adequately supervised to insure competent and quality work and workmanship required by this contract and all other regulations, codes and practices.

C. A “Foreman” shall be present during all work activity required to complete the project. “foreman” shall be an individual who has received appropriate training from a recognized training organization and who has adequate experience in the supervision of similar workforce. The qualification statement of the “Foreman” shall be submitted and approved by the Engineer prior to the start of work.

D. "Master" and "Journeyman" shall be individuals who have received appropriate training, and experience and who have taken and passed the appropriate tests as administered by a recognized testing agency. The qualifications of all "Master" and "Journeyman" tradesmen shall be submitted and approved by the Engineer prior to the start of work.

E. "Apprentice" shall be an individual who is currently in a recognized training program I the particular trade the express purpose of which is to result in the individual becoming licensed as a "Journeyman" in that trade? This individual shall be supervised at all times installation work is being completed.

F. "Laborer" or "Helper" shall be an individual who provides support of each the "Master," "Journeyman" and "Apprentice." This individual shall not perform any unsupervised installation.

G. The make up of the workforce shall be in the following ratio:

1. Master -1
2. Journeyman – 2 or more
3. Apprentice -1
4. Helper -1

Note that a "Master" can serve as a "Journeyman."

1.4 LOCAL CONDITIONS

A. Visit site and determine existing local conditions affecting work in contract.

B. Failure to determine site conditions or nature of existing or new construction will not be considered a basis for granting additional compensation.

1.5 CONTRACT CHANGES

A. Changes or deviations from Contract, including those for extra or additional work must be submitted in writing for review of Engineer. No verbal orders will be recognized.

1.6 LOCATIONS AND INTERFERENCES

A. Location of equipment, piping and other mechanical work is indicated diagrammatically on the Drawings. Determine exact locations on job, subject to structural conditions, work of other sections of the Specifications, access requirements for installation and maintenance and approval of Engineer.

B. Study and become familiar with the Drawings of other trades and in particular the general construction plans and details in order to obtain necessary information for figuring installation. Cooperate with work of other trades, and install work in such a way as to avoid interference with work of other trades. Minor deviations, not affecting design characteristics, performance or space limitation may be permitted if reviewed by Engineer prior to installation.

C. Any pipe, apparatus, appliance or other item interfering with proper placement of other work as indicated on Drawings, specified, or required, shall be removed and if so shown, relocated and reconnected without extra cost. Damage to new or existing work caused by Contractor shall be restored as specified for new work.

D. Do not scale Drawings for dimensions. Accurately lay-out work from dimensions indicated on Drawings unless such be found in error.

E. Report any conflict stated above to supervisor for coordination.

1.7 PERFORMANCE

A. Final acceptance of work shall be subject to the condition that all systems, equipment, apparatus and appliances operate satisfactorily as designed and intended. Work shall include required adjustment of systems and control equipment installed under this specification division.

1.8 WARRANTY

A. The plumbing systems are to be warranted to Owner and Engineer the quality of materials, equipment, workmanship and operation of equipment provided under this specification division for a period of one year from acceptance of electrical systems by Owner.

B. Contractor warrants to Owner and Engineer that on receipt of notice from either of them within one year of warranty period following date of acceptance all defects that have appeared in materials and/or workmanship, shall be promptly corrected to condition required by contract documents at contractor expense.

C. The warranty above expressed shall not supersede any separately stated warranty or requirements required by law or by these specifications.

1.9 ALTERNATES

A. Reference Architectural Specification.

PART 2 - PRODUCTS

2.1 MATERIALS, EQUIPMENT AND SUBSTITUTIONS

A. The intent of these specifications is to allow ample opportunity for bidder to use its ingenuity and abilities to perform the work to its and the Owner's best advantage, and to permit maximum competition in bidding on standards of materials and equipment required.

B. Material and equipment provided shall be first class quality, new, unused and without damage unless noted otherwise.

C. In general, these specifications identify required materials and equipment by naming first the manufacturer whose product was used as the basis for the project design and specifications. The manufacturer's product, series, model, catalog and/or identification numbers shall set quality and capacity requirements for comparing the equivalency of other manufacturer's products. Where other manufacturer’s names are listed they are considered an approved manufacturer for the product specified, however; the listing of their names implies no prior approval of any product they may propose to furnish as equivalent to the first named product unless specific model or catalog numbers are listed in these specifications or in subsequent addenda. Where other than first named products are used for base bid proposal it shall be the responsibility of the Contractor to determine prior to bid time that the proposed materials and equipment selections are products of approved manufacturers which meet or exceed the specifications and are acceptable to the Engineer.

D. Where materials or equipment are described but not named, provide required items of first quality, adequate in every respect for intended use. Such items shall be submitted to Engineer for review prior to procurement.

E. Prior to receipt of bids, if the Contractor wishes to incorporate products other than those named in the specifications or drawings they shall submit a request for approval of equivalency in writing to the A/E no later than (10) ten calendar days prior to bid date. Engineer will review requests and acceptable items will be listed in an Addendum issued to principal bidders. Equivalents will ONLY be considered approved when listed by project addendum. Substitutions after this may be refused at Engineers option.

F. Materials and equipment proposed for substitution shall be equal to or superior to that specified in construction, efficiency, utility, aesthetic design, and color as determined by Engineer whose decision shall be final and without further recourse. Physical size of substitute brand shall be no larger than space provided including allowances for access for installation and maintenance. Requests must be accompanied by two (2) copies of complete descriptive and technical data including manufacturer's name, model and catalog number, photographs or cuts, physical dimensions, operating characteristics and any other information needed for comparison. .In proposing a substitution prior to receipt of bids, include in such proposal cost of altering other elements of project, including adjustments in mechanical/electrical service requirements necessary to accommodate such substitution.

G. In proposing a substitution prior to receipt of bids, include in such bid all costs of altering other elements of the project, including such items as adjustments in mechanical/electrical service requirements necessary to accommodate such substitutions. In addition, all physical space and weight requirements requiring additional structural support, modifications to the base floor plans, equipment concrete pad/roof curb dimensions shall be incorporated as required into such bid to accommodate such substitutions.

H. Within ten (10) working days after bids are received, apparent low bidder shall submit to A/E for approval three copies of a list of all major items of equipment he intends to provide. As soon as practicable and within ten (10) working days after award of contract, Contractor shall submit shop drawings for equipment and materials to be incorporated in work for Engineer's review. Where ten (10) working day limit is insufficient for preparation of detailed shop drawings on major equipment or assemblies, Contractor shall submit manufacturer's descriptive catalog data and indicate date such detailed shop drawings will be submitted along with manufacturer's certifications that order was placed within ten (10) working day limit.

PART 3 - EXECUTION

3.1 SHOP DRAWINGS

A. Contractor shall furnish shop drawings of all materials and equipment. These shop drawings shall be submitted to the Engineer in electronic “PDF” format. A copy of fully processed product data submittal shall be included as a part of each operating and maintenance manual.

B. Where catalog cuts are submitted for review, conspicuously mark or provide schedule of equipment, capacities, controls, fitting sizes, etc., that are to be provided. Mark submitted item with applicable section and paragraph numbers of these specifications, or Drawing sheet number when item does not appear in specifications. Where equipment submitted does not appear in specifications or specified equivalent, mark submittals with applicable alternate numbers, change order number or letters of authorization. Each catalog sheet shall bear Equipment Manufacturer’s name and address. All shop drawings on materials and equipment listed by UL shall indicate UL approval on submittal.

C. Contractor shall be required to submit all applicable equipment/material assembly mock-ups as required by the Contract Documents for Engineer approval. Contractor shall provide changes and resubmit mock-ups until Engineer is satisfied final product meets or exceeds stated specifications and quality of specified product.

D. Contractor shall check all shop drawings to verify that they meet specifications and/or drawings requirements before forwarding submittals to the Engineer for their review.

E. All shop drawings submitted to Engineer shall bear Contractor's approval stamp which shall indicate that Contractor has reviewed submittals and that they meet specification and drawing requirements. Contractor's submittal review shall specifically check for but not be limited to the following: equipment capacities, physical size in relation to space allowed, electrical characteristics, provisions for supply, return and drainage connections to building systems. All shop drawings not meeting Contractor's approval shall be returned to its supplier for resubmittal.

F. No shop drawing submittals will be considered for review by the Engineer without Contractor's approval stamp, or that have extensive changes made on the original submittal as a result of Contractor's review. All comments or minor notations on shop drawings shall be flagged to indicate originator of comment.

G. Engineer's review of shop drawings will not relieve Contractor of responsibility for deviations from drawings and specifications unless such deviations have been specifically approved in writing by Owner or its representative, nor shall it relieve Contractor of responsibility for errors in shop drawings. No work shall be fabricated until Engineer's review has been obtained with "no exceptions" or "as noted" language. Any time delay caused by correcting and resubmitting shop drawings will be Contractor's responsibility.

H. Contractor shall submit the following items for this project:

a. Domestic Water Heating Heat Exchanger
b. Domestic Water Storage Tank
c. Pumps
d. Expansion Tank
e. Piping
f. Piping Insulation
g. Valves
h. Steam Specialties
i. Pipe Insulation
j. Domestic Water Heater Insulation and Jacketing

3.2 SETTING, ADJUSTMENT AND EQUIPMENT SUPPORTS

A. Work shall include mounting, alignment and adjustment of systems and equipment. Set all equipment level on adequate supports and provide proper anchor bolts and isolation as shown or specified. Equipment failures resulting from improper installation or field alignment shall be repaired or replaced by Contractor at no cost to Owner.

B. Provide each piece of equipment or apparatus with suitable structural support, platform or carrier in accordance with best recognized practice. Contractor shall arrange for attachment to building structure, unless otherwise indicated on drawings or as specified. Provide hangers with vibration eliminators where required.

3.3 PRE-FINAL AND FINAL CONSTRUCTION REVIEW

A. At Contractor's request, Engineer will make pre-final construction review to determine if to the best of its knowledge project is completed in accordance with Contract Documents.

B. Items found by Engineer as not complete or not in accordance with requirements of contract will be outlined in report to Engineer for forwarding to Subcontractors. Subcontractor shall complete and/or correct these items, before notifying Engineer it is ready for final review.

C. All necessary system adjustments, including air systems balancing, shall be completed and all specified records and reports submitted in sufficient time to be received by Engineer at least ten working days prior to date of final construction review.

D. At final construction review, Contractors shall be present or shall be represented by a person of authority. Each shall demonstrate, as directed by Engineer that work complies with purpose and intent of contract documents and shall provide labor, services, instruments or tools necessary for such demonstrations and tests.

END OF SECTION 230500

SECTION 230501 - EXTENT OF CONTRACT WORK AND CODES

PART 1 - GENERAL (Reference Section 220500)

1.1 GENERAL EXTENT OF WORK INCLUDED IN CONTRACT

A. Provide mechanical systems indicated on Drawings, specified or reasonably implied. Provide every device and accessory necessary for proper operation and completion of plumbing systems. In no case will claims for "Extra Work" be allowed for work about which Contractor could have been informed before bids were taken.

B. Become familiar with equipment provided by other Subcontractors which require plumbing connections and controls.

C. Electrical work required to install and control plumbing equipment which is not indicated on Drawings or specified under Division 26 shall be included.

D. The cost and provision of larger wiring, conduit, control, and protective devices resulting from installation of equipment which was not used for basis of design as outlined in specifications shall be provided at no increase in contract price.

E. Provide supervision to subcontractor to insure that required connections, interlocking and interconnection of mechanical and electrical equipment are made to attain intended control sequences and system operation.

1.2 CODES, ORDINANCES, RULES AND REGULATIONS

A. Provide work in accordance with applicable rules, codes, ordinances and regulations of Local, State, Federal Governments, and other authorities having lawful jurisdiction.

B. Conform to latest editions and supplements of following codes, standards or recommended practices.

1. International Plumbing Code-2012.
2. International Mechanical Code-2012
3. International Building Code-2012.
4. Occupational Safety and Health Standard (OSHA) - Department of Labor.
5. NFPA No. 70 National Electrical Code-2014

C. Drawings and specifications indicate minimum construction standard, should any work indicated be sub-standard to any ordinances, laws, codes, rules or regulations bearing on work, Contractor shall promptly notify Engineer in writing before proceeding with work so that necessary changes can be made. However, if Contractor proceeds with work knowing it to be contrary to any ordinances, laws, rules, and regulations he shall thereby have assumed full responsibility for and shall bear all costs required to correct non-complying work.

D. Contractor shall secure and pay for necessary permits and certificates of inspection required by governmental ordinances, laws, rules or regulations. Keep a written record of all permits and inspection certificates and submit two copies to Engineer with request for final review.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 DRAWINGS

A. Drawings are to be considered diagrammatic for all systems. Drawings do not show all required offsets and fittings. Contractor shall include in bid costs to provide systems which will coordinate with all other building trades and systems.

END OF SECTION 230501

SECTION 230529 – HANGERS AND SUPPORTS FOR PIPING AND EQUIPMENT

PART 1 - GENERAL (Reference Section 220500)

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Provide and be responsible for locations of piping hangers, supports and inserts, etc., required for installation of piping under this contract. Design of hangers and supports shall conform to current issue of Manufacturers Standardization Society Specification (MSS) SP-58.

B. Pipe hangers shall be capable of supporting piping in all conditions of operation. They shall allow free expansion and contraction of piping, and prevent excessive stress resulting from transferred weight being induced into pipe or connected equipment. Support horizontal or vertical pipes at locations of least vertical movement.

C. Where horizontal piping movements are such that hanger rod angularity from vertical is greater than 4 degrees from cold to hot position of pipe, offset hanger, pipe, and structural attachments to that rod is vertical in hot position. Hangers shall not become disengaged by movements of supported pipe.

D. Provide sufficient hangers to adequately support piping system at specified spacing, at changes in piping direction and at concentrated loads. Hangers shall provide for vertical adjustment to maintain pitch required for proper drainage, and for longitudinal travel due to expansion and contraction of piping. Fasten hangers to building structural members wherever practicable.

E. Unless indicated otherwise on drawings support horizontal pipe and tubing as follows:

NOM. PIPE SIZE	ROD DIAMETER	MAXIMUM SPACING
Up to 1"	3/8"	6Ft.
1-1/4" to 1-1/2"	3/8"	8 Ft.
2" to 3”	3/8"	9 Ft.

F. Provide continuous threaded electro galvanized hanger rods wherever possible. No chain, wire, or perforated straps shall be used. Hanger rods shall be subject to tensile loading only, where lateral or axial pipe movement occurs provide suitable linkage to permit swing. Provide pipe support channels with galvanized finish for concealed locations and painted finish for exposed locations. Submit design for multiple pipe supports indicating pipe sizes, service and support detail to Engineer for review prior to fabrication.

G. Mount hangers for insulated piping on outside of pipe insulation sized to allow for full thickness of pipe insulation. Provide Grinnell Fig. 167 insulation protection shields sized so that line compressive load does not exceed one-third of insulation compressive strength. Shield shall be galvanized steel and support lower 180 degrees of pipe insulation on copper tubing. Provide wood block at each pipe hanger in thickness of insulation. Insulation vapor barrier jacket shall overlap wood block to maintain vapor barrier.

H. Structural attachments for pipe hangers shall be as follows:

1. Concrete Structure: Provide expansion bolt or drop in expansion anchor for loads up to 400 lbs.
2. Steel Structure: Provide suitable beam clamps for loads up to 400 lbs.

I. Provide Grinnell pipe hangers for horizontal single pipe runs as follows:

PIPE MATERIAL	PIPE SIZE	HANGER FIG. NO.
All	1/2" thru 4"	CT-65

J. Provide necessary structural steel and attachment accessories for installations of pipe hangers and supports. Where heavy piping loads are to be attached to building structure verify structural loading with Engineer prior to installations.

2.3 EQUIPMENT ANCHORS

A. Provide floor or foundation mounted equipment such as pumps, boilers, air handling units, etc. with concrete expansion anchors.

B. Anchors shall be proper type and size recommended by manufacturer for equipment to be anchored.

C. Equivalent hangers by Autogrip, B-Line, CHD Inc., or Power Strut.

END OF SECTION 230529

SECTION 230553 – IDENTIFICATION FOR PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 REQUIRED WORK

A. Provide the reasonable identification of piping as specified below.

PART 2 - PRODUCTS

2.1 PIPING IDENTIFICATION

A. Identify piping for all new piping including domestic hot, cold and hot return water piping; low pressure steam, pumped or gravity flow steam condensate return, drain lines, etc. at intervals indicated below. Provide color coded stencil markings for each type of pipe utilized and provide flow direction arrows. Provide standard stencils, prepared with letter sizes conforming to recommendations of ASME A13.1. Stencil paint shall be exterior use, oil-based, alkyd gloss enamel in colors according to ASME A13.1. Paint may be in pressurized spray-can form.

B. All letter stenciling shall be minimum 1-1/4" high. Colors and wording shall be as directed by the Owner, using standard colors and standard abbreviations of all services being identified. Contractor shall submit for approval list of colors and wording prior to purchase of pipe marking equipment/material/installation. Pipe markers shall meet applicable ANSI Standard and OSHA requirements.

Piping Section	Pipe Identification Spacing (max spacing)
Within Mechanical Rooms	8'-0" on center
Above Ceilings	20'-0" on center and within 3' of elbows

END OF SECTION 230553

SECTION 230600 - THERMOMETERS AND GAUGES

PART 1 - GENERAL (Reference Section 15010)

PART 2 - PRODUCTS

2.1 THERMOMETERS AND GAUGES

A. Provide thermometers and wells and pressure test plugs as hereinafter specified and shown on the plans so that proper testing and balancing and troubleshooting can be accomplished.

2.2 THERMOMETERS

A. Thermometers shall be red reading mercury type having scale length of not less than 9", and scale divisions of 2 degrees F, or less similar and approved equal to Moeller Instrument Company, Inc., Style AJ. Range shall be as specified or as required for the duty. Thermometers and wells must be of at least the quality and design specified. If it complies with these specifications, equipment manufactured by one of the following manufacturers will be acceptable: Moeller, Trerice or Weksler.

2.3 GAUGES

A. Gauges shall be bourdon tube with minimum 4-1/2" dial and die cast aluminum case with black enamel finish. The movement shall be all stainless steel with Grade A phosphor bronze bourdon tube brazed at socket and tip. The accuracy of the gauge shall be within 1/2 percent of the scale range. The pointer shall be the micrometer adjustment type recalibrated from the front. Pressure, compound, and differential pressure gauges shall have suitable scale ranges, shall be submitted and are subject to the review of the Engineer. Graduations shall be one pound or less on all gauges where this is standard for the required range.

B. Gauges shall have 1/4" IPS connections and shall be Moeller "Vantage" gauges with Case Style No. 2, or approved equal. If it complies with these specifications, equipment manufactured by one of the following manufacturers will be acceptable: Ashcroft, Marsh, Trerice, Moeller, Weksler, Taylor, Weiss, or Midwest.

C. Install a SISCO 1/4" or 1/2" NPT fitting (Test Plug) of solid brass at desired indicated locations. Test plug shall be capable of receiving either a pressure or temperature probe 1/8" o.d. Dual seal core shall be neoprene for temperature to 200^{o}F and shall be rated zero leakage from vacuum to 1000 psig.

2.4 Thermometer and Sensor Wells and Gauge Cocks

A. Thermometer and sensor wells shall be installed as hereinafter specified. Where thermometer or in tank sensor is scheduled, a well shall be provided. All wells shall be constructed of brass or stainless steel and where installed in insulated piping shall have at least 2-1/2" lagging extension.

B. Gauges shall be installed as hereinafter specified. Gauge cocks shall be polished brass A10 1/4" tee handle type with threaded ends. 125 psi rated. Provide gauge cock with 1/4" pipe nipple for connection to gauge cock.

C. Pressure temperature ratings of each well shall be suitable for the system in which it is installed in accordance with specifications and as indicated on the drawings. All wells shall be filled with Silicon and be complete with caps and chains.

D. Thermometers shall have the temperature ranges as required for the intended application and shall be installed as scheduled.

PART 3 - EXECUTION

3.1 THERMOMETER AND TEST GAUGE INSTALLATION REQUIREMENTS

A. Provide Thermometers, Test Gauges, and Connection apparatus as required by the following schedule.

THERMOMETER & TEST GAUGE COCK INSTALLATION SCHEDULE

	Thermometer & Well	Press Gauge & Gauge Cock	Gauge Cock	Pete's Plug
Hot water Leaving each Hot water coil	X			
Hot Water Entering and Leaving Heat Exchanger		X		X
Hot Water Entering and Leaving Each Pump				X

END OF SECTION 230600

SECTION 230700 – HVAC AND DOMESTIC WATER PIPING INSULATION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Provide necessary materials and accessories for installation of insulation for plumbing and mechanical systems as specified and/or detailed on drawings insulation type, jacket, and thickness for specific piping systems or equipment shall be as listed in insulation schedule.

B. Provide insulation materials manufactured by Armstrong Cork Co. Certain/Teed Saint Gobain, Dow Chemical, Johns-Manville or Owens-Corning Fiberglass.

C. Insulation, except where specified otherwise, shall have composite fire and smoke hazard ratings as rested by ASTM E-84, NFPA 255, and UL 723 procedures not exceeding:

FLAME SPREAD	25
SMOKE DEVELOPED	50
FUEL CONTRIBUTED	50

D. Provide insulation accessories such as adhesives, mastics, cements, tape and glass fabric with same component ratings as listed above. Products or their shipping cartons shall bear label indicating their flame and smoke safety shall be permanent. Use of water soluble treatments such as corn paste or wheat paste is prohibited. This does not exclude approved lagging adhesives.

E. Install insulation over clean dry surfaces with joints firmly butted together. Insulation at equipment, flanges, fittings, etc. shall have straight edges with box type joints with corner beads as required. Where plumbing and heating insulation terminates at equipment or unions, taper insulation at 30 degree angle to pipe with one coat finishing cement and finish same as fittings. Total insulation system shall have neat smooth appearance with no wrinkles, or folds in jackets, joint strips or fitting covers.

F. Undamaged insulation systems on cold surface piping and equipment shall perform their intended functions as vapor barriers and thermal insulation without premature deterioration of insulation or vapor barrier. Contractor shall take every reasonable precaution to provide insulation systems with continuous unbroken vapor barriers.

G. Where glass fabric is specified in the following insulation methods provide resin impregnated white open weave glass fabric with 10/20 thread count. Provide glass cloth similar to Alpha Martex wettable glass cloth.

H. Abbreviations for manufacturers of adhesive, mastics and coating specified shall be C.M. for Chicago Mastic Company and B.F. for Benjamin Foster Company.

I. Insulation of removable heads, manholes access covers, etc., shall be fabricated to allow removal without damage to insulation. Provide removable units with vapor-proof cover fabricated to be sealed to equipment vapor barrier.

J. Insulation failing to meet workmanship and appearance standards shall be replaced with an acceptable installation before final acceptance of project will be given. Insulation failing to meet performance requirements of this specification for a period of one year after date of final acceptance or through one heating season and one cooling season, whichever is longer shall be replaced with an acceptable installation. All costs to correct insulation deficiencies and costs to repair damages to other work shall be at Mechanical Contractors expense at no cost to owner.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS AND APPLICATION METHODS (PIPING)

A. Pipe insulation by type shall be as follows:

1. TYPE 1-PHC: Insulation for hot and cold surface piping systems with -60 degrees F to +650 degrees F operating range shall be Owens-Corning Fiberglass ASJ/SSL-11, 4.2 lb. density pipe insulation with white fire retardant ASJ jacket and double self-sealing lap. Average thermal conductivity shall not exceed .26 BTU/Hr. at 75 degrees F mean temperature. Seal longitudinal jacket laps and butt strips with C.M. No. 17-465 or B.F. No. 85-75 vapor barrier adhesive. Insulate valves and fittings as follows:

a. On all hot service piping terminate insulation, taper and seal raw insulation edges with mastic, on either side of all valves, strainers and unions.

B. Insulation of heat exchanger.

1. Provide min 1 ½" thick fiberglass insulation with all service jacket over entire tank. Taper and seal raw edges with mastic at all tapings and manway. Jacket using min .016" thick aluminum with stippled finish.

C. Insulation materials and application methods (Pumps and expansion tanks)

1. Type 1-EC: Insulation for hot and cold surface equipment insulation for external surfaces with +40 degrees F to +220 degrees F operating temperature range shall be Armstrong FR/Armaflex pipe or sheet insulation as required with 5.5" or 6.0 lb. density. Average thermal conductivity shall not exceed .27 BTU/HR at 75 F mean temperature. Apply insulation directly to metal surfaces and seal insulation joints with Armstrong No. 520. Insulation shall be mitered, beveled and built-up as required to provide a smooth and neat exterior surface. On large pumps and equipment provide joints in insulation at points where equipment casing must be disassembled for maintenance and repair. Insulate these joint areas so that insulation can be easily removed from casing joints without removing or damaging adjacent insulation. Finish insulation with two coats of Armstrong Armaflex vinyl-lacquer finish.

PART 3 – EXECUTION

3.1 PIPE INSULATION SCHEDULE

A. Refer to schedule on plans.

END OF SECTION 230700

SECTION 230701 - DUCTWORK INSULATION

PART 1 – GENERAL (Reference Section 230500)

PART 2 – PRODUCTS

2.1 DUCTWORK INSULATION

A. Provide necessary materials and accessories for installation of interior and exterior ductwork insulation as specified and/or detailed on drawings. Insulation type and thickness for specific ductwork systems shall be as listed in insulation schedule in this section of specification. Provide insulation materials manufactured by Schuller, Knauf Fiberglass, Certain/Teed, or Owens-Corning Fiberglas.

B. Insulation and application adhesives, except where specified otherwise, shall have fire and smoke hazard rating as tested by ASTM E-84 procedure not exceeding:

FLAME SPREAD	25
SMOKE DEVELOPED	50
FUEL CONTRIBUTED	50

C. Insulation shall meet ASTM C411 performance test and shall be installed in conformance with NFPA Standard 90A.

D. Install interior duct liner insulation cut to insure tight fitting corner, and longitudinal joints. Apply liner to sheet metal with 100% coverage of adhesive applied in accordance with manufacturers recommended applications rate. Coat all edges of liner with adhesive. Provide mechanical fasteners on surfaces 18" or wider in addition to liner adhesive with fastener clips set flush with duct liner surface. Provide fasteners as follows:

1. Low Velocity Ductwork (Velocities less than 2000 FPM): Provide fasteners within 3" of leading edge of each section 12" O.C. around joint perimeter and 3" from longitudinal joints 12" O.C. Elsewhere space fasteners 18" O.C. except not more than 6" from longitudinal joints and not 12" from corner break.

E. Provide round sheet metal ductwork with exterior thermal insulation of type and thickness listed in insulation schedule. Apply insulation with joints tightly butted together with longitudinal and end joint strips sealed with vapor barrier adhesive. Insulate fittings with insulation thickness equal to adjoining insulation with cover overlapping 2" onto adjacent covering.

F. Eliminate ductwork insulation on exposed round ductwork unless noted otherwise in ductwork insulation schedule.

G. Duct insulation materials by type shall be as follows:

1. Type 1-DIL: Internal acoustical and thermal duct insulation for low and high velocity ductwork shall be 2 lb. density for 1/2" thick and 1.5 lb. density for 1" thick duct liner with 1.08 @ 1000 FPM friction coefficient and .24 BTUH thermal conductivity at 75 degrees mean temperature.
2. Type 2-DEW: External thermal insulation for low, medium and high pressure duct shall be 1.0 lb. density standard duct insulation type IV with foil-scrim-craft facing and .27 BTUH thermal conductivity at 75 degrees mean temperature.

3. Type 3-DEW: External thermal insulation for low pressure ductwork. Fiberglass with .23 Btuh thermal conductivity at 75°F mean temperature and fire retardant polyethylene .003" thick jacket. Insulation shall be premanufactured sleeve type for installation over round low velocity ductwork.
4. Type 4-DEW: External fire insulation for grease ducts to provide a 2 hr. fire resistance rating shall be Pabco Super Firetemp-L. Install as per manufacturer's recommendation. Equivalent by 3M ductwrap, provide (2) 1½" layers.

H. Specific insulation materials and installation methods for ductwork systems shall be as follows:

DUCTWORK SYSTEM	DUCT INSULATION TYPE	THICKNESS
Low Pressure Rectangular		
Supply & Return	2-DEW	1-1/2"
Rectangular Outside Air	2-DEW	1-1/2"
Return Air Boot	1-DIL	1/2"
Low Pressure Round Ductwork (<12")	3-DEW or 2-DEW	1-1/2"
Low Pressure Round (>12")	2-DEW	1-1/2"

END OF SECTION 230701

SECTION 231116 –PIPING, FITTINGS, VALVES and SPECIALTIES

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 domestic water and gas system piping where indicated on the plans inside the building.

1.3 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of withstanding the following minimum working-pressure ratings, unless otherwise indicated:
   1. Domestic Water Piping: 150 psig.
   2. Drain Piping: 10 psig.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to plans and following specification information for pipe, tube, fitting, and joining materials.

2.2 PIPING MATERIALS AND FITTINGS

A. Piping used throughout project shall conform to the following specifications. Piping shall be plainly marked with manufacturers name and weight. All materials listed may not be required on this project. Piping materials shall be as follows:

B. Copper Pipe (1/8" thru 3"):

   1. Provide type L hard temper copper piping conforming to ASTM specification B-88.
   2. Pipe joints shall be soldered using tin/silver solder, Bridget “Stay-Brite” or equal.
   3. Fittings and connectors shall be wrought copper, solder joint type conforming to ANSI standard B16.22.
   4. “T-Drill” connections will not be acceptable or allowed.

C. Carbon Steel Pipe (1/8" thru 2"):

   1. Provide seamless carbon steel conforming to ASTM specification A-106.
   2. Pipe joints shall be threaded conforming to ANSI Standard B2.1.
   3. Pipe by Armco, Jones, Laughlin Steel Corp., Youngstown Sheet and Tube Co., or United States Steel.

D. Carbon Steel Pipe (2-1/2" and above):

1. Provide electric resistance welded carbon steel pipe conforming to ASTM Specification A-53.
2. Pipe ends shall be beveled for welding.
3. Pipe by Armco, Jones and Laughlin Steel Corp., Youngstown Sheet and Tube Co., or United States Steel.

2.3 STEEL PIPING FITTINGS

A. Piping fitting used throughout project shall be proper type for installation method used and shall be compatible with piping system material. Fittings listed in piping material schedule shall conform to the following specifications:

B. Carbon Steel Welding Fittings:

1. Provide carbon low alloy seamless steel welding fittings conforming to current ANSI Standard B16.9 and ASTM Specification A234.
2. Fittings by Grinnell, Midwest or Tube Turn.

C. Branch Connection Welding Fittings:

1. Provide carbon steel weldolet fittings conforming to ANSI Standards B16.9, B16.11, B31.1.0 and ASTM specification A105, Grade 11.
2. Fittings by Bonney Forge.

D. Branch Connection, Welding to Screwed Fitting:

1. Provide carbon steel threadolet fitting conforming to ANSI Standards B16.9, B16.11, B31.1, and ASTM Specification A105, Grade 11.
2. Fittings by Bonney Forge.

E. Carbon Steel Flanges:

1. Provide carbon steel flanges conforming to ASTM Specification A181, Grade 1, and ANSI Standard B16.5.
2. Use only weld neck flanges unless allowed in writing by Engineer to use slip on flanges.
3. Flanges by Babcock and Wilcox, Grinnell, Midwest or Tube Turn.

2.4 VALVES

A. Provide valves based on pipe sizes, piping system served, and piping material as indicated in the valve schedule shown on the plans.

2.5 UNIONS

A. Unions shall be installed where shown on plans and in each line proceeding connections to equipment and valves.

B. Unions shall be as required by piping system within which they are installed.

2.6 STRAINERS

A. Install strainers where shown on plans. Strainers shall be same size as piping. Provide strainers with proper isolation and blow down valves to allow basket removal for cleaning.

B. Strainer shall be self cleaning with screwed and gasketed caps and screwed connections. Provide stainless steel screen with standard mesh for water service.

2.7 CHECK VALVES

A. Install check valves where shown on plans. Check valves shall be same size as piping. Provide spring loaded or swing style check valves with body material as required by placement and system within which it is being installed. Provide stainless steel trim.

2.8 FLOAT AND THERMOSTATIC STEAM TRAPS

A. The trap shall be of the mechanical ball float type, fabricated from cast iron to ASTM A48 Cl. 30, with threaded pipe connections. The float, lever and valve assemblies shall be of stainless steel. The trap shall incorporate a balanced pressure thermostatic air vent with a phosphor bronze bellows caged in stainless steel. The trap body shall be furnished with a plugged bottom drain connection and a tapped top port for the addition of an integral vacuum breaker. The trap shall be completely serviceable without disturbing the piping. The trap shall be Dunham Bush, Hoffman or Spirax Sarco or Equal as indicated on plans or equal.

2.9 EXPANSION TANKS

A. Provide, where indicated on plans and as specified here-in, ASME rated, pre-charged diaphragm-type thermal expansion compensator designed to absorb the forces of expanding water and to protect the hydronic water system from pressure build up due to heating of the water.

B. Tank shall be carbon steel with stainless steel system connection with FDA approved heavy duty butyl diaphragm and polypropylene liner.

C. Expansion tanks shall be rated 200 deg F., 150 PSI.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Pipe sizes indicated on plans and as specified refer to nominal size in inches for steel pipe, unless otherwise indicated. Pipes are sized to nearest 1/2". In no case shall piping smaller than size specified be used.

B. Contractor shall provide and be responsible for proper location of pipe sleeves, hangers, supports, and inserts. Install hangers, supports, inserts, etc., as recommended by manufacturer and as specified and detailed on drawings. Verify construction types and provide proper hangers, inserts and supports for construction used. Install inserts, hangers and supports in accordance with manufacturers load ratings and provide for thermal expansion of piping without exceeding allowable stress on piping or supports. Provide solid type hangers and supports where pipe travel exceeds manufacturer's recommendations for fixed hanger and supports.

C. Install piping parallel with building lines and parallel with other piping to obtain a neat and orderly

appearance of piping system. Secure piping with approved anchors and provide guides where required to insure proper direction of piping expansion. Piping shall be installed so that allowable stress for piping, valves and fittings used are not exceeded during normal operation or testing of piping system.

D. Provide piping materials and wall thickness for specific piping systems as listed here in.

E. Provide unions or flanged joints in each pipe line preceding connections to equipment to allow removal for repair or replacement. Provide all screwed and control valves with unions adjacent to each piping connection. Provide screwed end valves with union adjacent to valve unless valve can be otherwise easily removed from line.

F. Piping fitting materials for specific piping systems shall be as listed here in. Fitting shall be approved factory made type with threaded, sweat or solvent weld ends as required. Fittings pressures and temperature ratings shall be equal to or exceed maximum operating temperature and working pressure of piping system. No mitered or field fabricated pipe fittings will be permitted.

G. All pipe threads shall meet ANSI Standard B2.1 for taper pipe threads. Lubricate pipe threads with Astroseal teflon thread sealant and lubricating compound applied full strength. Powdered or made-up compound will not be permitted. Pipe thread compound shall be applied only to male pipe threads.

I. Make changes in piping size and direction with approved factory made fittings. Refer to piping material and fitting requirements as specified here in for type of fittings to be used for each type of system utilized. Provide fittings suitable for pressure ratings indicated on piping material and fitting schedule on the plans.

3.2 WELDING

A. Contractor shall be responsible for quality of welding and suitability of welding procedures. All welding shall be in accordance with American Welding Society Standard B3.0 and ANSI Standard B31.9.

B. Welding shall be done only by welders who have successfully passed welder qualifications tests in previous 12 months for type of welding required. Each welder shall identify his work with a code marking before starting any welded pipe fabrication. Contractor shall submit three copies of a list of welders who will work on project listing welders code, date and types of latest qualification test passed by each welder.

C. Welded joints shall be fusion welded.

D. Bevel all piping and fittings in accordance with recognized standards by flame cutting or mechanical means. Align and position parts so that branches and fittings are set true. Make changes in direction of piping systems with factory made welding fittings. Make branch connections with welding tees or forged weldolets.

E. Quality Control

1. Prior to the start of any welding, submit a summary of the procedures to be followed by all welders performing work on this project.
2. A sampling of the welds provided by the Contractor for this project may be x-rayed by the Owner in an effort to assure quality welding.

    a. The welds to be x-rayed will be selected by the engineer.

b. The x-rayed welds will be analyzed by a certified x-ray technician.
c. Allowable anomalies in the welds that are x-rayed shall be as follows:

(1) Cracks – None permitted.
(2) Lack of Fusion – The length of unfused areas shall not be more then 20% of the circumference of the pipe, or of the total length of the weld, and no more than 1½ in. any 6 in. of weld.
(3) Incomplete Penetration – The total joint penetration shall not be less than the thickness of the thinner of the components being joined, except that incomplete root penetration is acceptable if it does not exceed the lesser of 1/32 in. or 20% of the required thickness, and its extent is not more than 1½ in. in any 6 in. of weld.
(4) Undercut and Reinforcement – Undercut shall not exceed the lesser of 1/32 in. or 12 ½ % of wall thickness. Thickness of weld reinforcement shall not exceed 3/16 in.

(5) Concave Root – concavity of the root surface shall not reduce the total thickness of the joint, including reinforcement, to less than the thickness of the thinner of the components being joined.
(6) Excess Root Penetration – The excess shall not exceed the lesser of the 1/8 in. or 5% of the inside diameter of the pipe.
(7) Weld Surfaces – There shall be no overlaps or abrupt ridges and valleys.

3. If the x-ray of any of the various welds reveal deficiencies greater than allowable as indicated herein, the deficient weld shall be ground out, the joint rewelded, and the new weld x-rayed to prove that the criteria indicating maximum allowable anomalies is adhered to.

In addition, the Contractor shall x-ray an additional 10 welded joints not previously x-rayed in locations selected by the Engineer. All joints shall meet or exceed the criteria stated. If they do not, the deficient weld shall again be ground out and the joint rewelded.

This process shall continue until the Engineer is satisfied that all welded joints meet or exceed the criteria indicating maximum allowable anomaly in any given weld.

4. The cost for the original x-ray procedure as stated in E2 above shall be by the Owner. All required x-ray procedures or required corrective action subsequent to the original x-ray procedure as stated in E2 above shall be provided by the Contractor.

3.3 FIELD QUALITY CONTROL

A. Inspect piping as follows:

1. Do not put piping into operation until it is inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
3. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test piping as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced water piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
4. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.4 CLEANING

A. Clean piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction and the chemical treatment vendor.

END OF SECTION 231116

SECTION 233000 - CENTRIFUGAL PUMPS FOR HYDRONIC SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUBMITTALS

A. Product Data: Include performance curves, furnished specialties, and accessories for each type and size of pump indicated.

B. Shop Drawings: Show layout and connections for pumps. Include setting drawings with templates, directions for installing foundation and anchor bolts, and other anchorages.

1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For each type and size of pump specified to include in maintenance manuals specified in Division 1.

1.3 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, connections, and dimensional requirements of pumps and are based on specific manufacturer types and models indicated. Other manufacturers' pumps with equal performance characteristics may be considered.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect bearings and couplings against damage.

C. Comply with pump manufacturer's rigging instructions for handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Centrifugal Pumps:

a. Bell & Gossett
b. Armstrong
c. Aurora
d. Taco

2.2 CENTRIFUGAL PUMPS, GENERAL

A. Description: Factory-assembled and tested, centrifugal, inline or base mounted as scheduled on drawings. Include motor, couplings, and construction for permanent installation.

B. Discharge Pipe End Connections:
1. NPS 2-1/2" (DN65) and larger: flanged
2. 2" and smaller: threaded.

C. Motors: Single speed, with grease-lubricated ball bearings, and non-overloading through full range of pump performance curves.

D. Finish: Manufacturer's standard paint applied to factory-assembled and -tested units before shipping.

E. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembling and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

2.3 INLINE PUMPS

A. In-line centrifugal pumps shall be close coupled with grease lubricated ball bearings, bronze fitted with mechanical seals.

B. Pump shall be bronze construction, bronze fitted with bronze shaft sleeves, impellers shall be dynamically balanced, ball bearings shall be regreaseable. Pump shall have carbon vs. ni-resistant mechanical seals, internal flush line between casing and stuffing box, 125 psi flanges 175 psi case working pressure, carbon steel shaft. Provide flexible coupling guard.

C. Pump motors shall be provided for voltage as shown in schedule on plans. Motors from 0-60 HP shall be suitable for across the line start. Motors shall be as shown in schedule on plans.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of piping systems to verify actual locations of piping connections before pump installation.

3.2 INSTALLATION

A. Install pumps according to manufacturer's written instructions.

B. Install pumps and arrange to provide access for maintenance, including removal of motors, impellers, couplings, and accessories.

C. Support piping so weight of piping is not supported by pumps.

3.3 CONNECTIONS

A. Drawings indicate general arrangement of piping and specialties. The following are specific connection requirements:

1. Install discharge pipe sizes equal to or greater than diameter of pump nozzles, and connect to hydronic piping system.

B. Install electrical connections for power, controls, and devices.

C. Electrical power and control components, wiring, and connections are specified in Division 16 Sections.

D. Ground equipment.

1. Tighten electrical 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 and UL 486B

3.4 ADJUSTING

A. Pump Controls: Set pump controls for automatic start, stop, and alarm operation as required for system application and as indicated on drawings.

3.5 COMMISSIONING

A. Final Checks before Starting: Perform the following preventive maintenance operations:

1. Lubricate bearings.
2. Disconnect couplings and check motors for proper direction of rotation.

3. Verify that each pump is free to rotate by hand. Do not operate pump if it is bound or drags, until cause of trouble is determined and corrected.
4. Verify that pump controls are correct for required application.

B. Starting procedure for pumps with shutoff power not exceeding safe motor power is as follows:

1. Start motors.
2. Open discharge valves slowly.
3. Check general mechanical operation of pumps and motors.

END OF SECTION 233000

SECTION 233113 - DUCTWORK

PART 1 - GENERAL REQUIREMENTS (Reference Section 230500)

1.1 GENERAL

A. Construct ductwork as detailed on drawings and as detailed in the latest edition of the Sheet Metal and Air Conditioning Contractor's Association (SMACNA) Duct Manual. Details shown on project plans shall indicate specific construction methods to be used on this project, and shall be used in lieu of any alternate methods shown in SMACNA Duct Manual.

B. Construct and install ductwork to be completely free from vibration under all conditions of operation. Support and securely anchor ductwork and equipment from structural framing of building. Provide suitable intermediate metal framing where required between building structural framing.

C. Construct ductwork in accordance with operating static pressure range. Ductwork pressure classifications shall be as follows:

1. Low Pressure Ductwork: System operating static pressure 1.5" positive or negative of W.G. or less and velocities less than 2500 FPM.
2. High Pressure Ductwork: System operating static pressure 3" positive or negative of W.G. or less and velocities less than 4500 FPM.

D. All metal ductwork scheduled for interior thermal and acoustical liner is not sized on plans to include the proper thickness of insulation. Add 1" or 2" in height and width of ductwork as required to accommodate insulation thickness. Mount specialties such as turning vanes, campers, etc., to ductwork with that section insulated "Build Outs" to maintain continuity of thermal barrier.

E. Construct low pressure system ductwork to conform to latest edition of low pressure duct construction standards of SMACNA Duct Manual.

F. Construct medium and high pressure system ductwork to conform to latest edition of high pressure duct construction standards of SMACNA Duct Manual.

G. Provide spiral wound duct on all round ductwork greater than 10" dia.
Provide longitudinal seam duct on all round ductwork 10" dia or less.

H. Sealing of low and high pressure ductwork shall be as follows:

1. Option #1: Low and high pressure ductwork: Including supply, return and exhaust. Provide Hard Cast, Inc. “Duct Seal 321” fiber reinforced water base duct in accordance with manufacturers' directions on all joints, connectors, etc.
2. Option #2: Low and high pressure rectangular ductwork: Provide "Ductmate" systems as manufactured by Ductmate Industries, Inc. or an approved equal system.

PART 2 – PRODUCTS

2.1 RECTANGULAR STEEL

A. Provide new commercial quality, bright spangled galvanized sheet steel manufactured in the U.S.A.

2.2 EXPOSED ROUND DUCTWORK

A. All exposed round ductwork shall be 1” double wall insulated galvanized steel acoustical ductwork constructed with interlocking helical spiral lockseam unless noted otherwise. Inner liner shall be perforated galvanized steel.

B. Thermal insulation between double walls shall be 1” fiberglass for a maximum conductance of 0.27 btuh/ft²/ºF. Provide galvanized finish suitable for painting. All taps for diffusers or integral diffusers shall be factory welded into laser cut openings. Ductwork by Unite McGill or equivalent by Western Engineering, Lewis and Lambert and Linbad Spiro-Safe spiral ductwork. All diffuser boots shall be factory mounted into laser cut openings.

2.3 INSTALLATION

A. All ductwork shall be installed in strict accordance with latest edition of SMACNA "HVAC Duct Construction Standards".

B. Exposed ductwork shall be painted unless noted otherwise.

END OF SECTION 233113

SECTION 233300 - DUCTWORK ACCESSORIES

PART 1 – GENERAL (Reference Section 230500)

PART 2 – PRODUCTS

2.1 SHEET METAL SPECIALTIES

A. Specialties shall be factory fabricated items designed for low, medium or high velocity systems as required. Submit shop drawings on all specialties required with shop drawings of ductwork layout. Specialties shall be as follows:

1. Turning Vanes: High Pressure Aero/Dyne or equal 26 gauge H-E-P high efficiency profile air foil vanes mounted 2-1/8" on center on 24 gauge runners. Air turns by Barber-Coleman will be acceptable on low pressure only. Note: Turning vanes to be provided on all supply, return and exhaust ducts.
2. Extractors (Low Velocity): Carnes #1250 all aluminum air volume extractor. Unit shall be adjustable from full open to full closed position. Provide channel supports where recommended by manufacturer (length over 16", height over 8"). Provide Young end bearings and rod with regulator as hereinafter specified. Equivalent by Price.
3. Dampers: Provide 24 gauge minimum galvanized metal blades supported on duct with metal supports and locked in position with locking type damper arm by Carnes, Greenheck, Air Balance, Louvers & Dampers, FAP, Pottorff and Cesco
4. Backdraft Dampers: Unless backdraft dampers are specified with a particular piece of equipment. Provide Cesco #BDA or equal with 16 gauge aluminum blade with oiled bearings mounted in steel frame. Blades shall be balanced and connected with tie bar. Provide end seals and blade seals. Equivalent by Ruskin, Greenheck, Air Balance, Air Stream, Titus, Louvers & Dampers, FAP, Pottorff and Cesco.
5. Backdraft dampers: Where backdraft dampers are shown on plans installed behind wall louvers or roof relief vents, provide Cesco #BDA-101-H heavy-duty construction counter balanced to assist air flow complete with end seals and blade seals. Equivalent by Ruskin, Greenheck, Air Balance, Air Stream or Titus, Louvers & Dampers, FAP.
6. Flexible Connections: Metaledge Ventglas prefabricated flexible connection of 3-1/4" wide heat and fire resistant neoprene coated glass fabric with two 3" wide 24 gauge metal strips attached to each edge. Vent Fabrics, Inc., Duro-dyne Corp. or equal.
7. Access Doors: Provide access doors in ductwork ceiling, walls, or floors for access to ductwork valves, controls, piping etc., installed under this contract. Doors and frame shall be formed of not lighter than USS #14 gauge and #16 gauge steel, respectively. Hinges shall be concealed loose pin spring type. Locks shall be flush, screwdriver, cam action type. Doors and frames shall be furnished in prime coat of Higgins, Milcor, Donley or equal.
8. Round take-off fittings: Round take-off fittings to medium and high pressure rectangular ductwork in sizes 12" and larger shall be made with Wesco bell mouth fittings or approved equal. Factory fabricated 90 degree conical tees or 45 degree tees with 1/2" flange acceptable.
9. Round take-off fittings: Round take-off fittings from supply diffusers or registers to low pressure supply ductwork shall be Flexmaster #FLDE complete with locking damper and air scoop. Equivalent by Atco, Air Control Products.
10. Smoke Dampers: Prefco Model #5020 motorized fire/smoke damper. Power open, locked and reset, spring closed. Equivalent by Ruskin, Nailor, Greenheck, Air Balance.
11. Low Pressure Flexible Duct: Thermaflex GK-M rated for +6" W.G. max. and -1" W.G. max. for duct sizes 4" to 14", +6" W.G. max. and -0.5" W.G. max for duct sizes 14" to 16", +4" W.G. max. and -0.5" W.G. max for duct sizes 18" to 20". Rated for 3500 FPM maximum velocity. UL listed "UL-181 Standards Class I Duct Material" complying with NFPA Standards 90A and 90B. Duct shall be composed of an acoustically rated inner polymeric liner duct bonded to coated steel wire helix. Fiberglass insulation and tear resistant metalized polyester film outer vapor barrier. Equivalent by Wiremold, Cleavaflex, Flexmaster.

12. Fire Dampers: Prefco 'LPB' low profile 1 1/2 hr rated. Stacked blade design for minimum reduction of cross sectional area of penetrations and ducts. 165 degree fusible link. Equivalent by Nailor, Greenheck, Ruskin, Air Balance.

2.2 INSTALLATION

A. All ductwork accessories shall be installed in strict accordance with manufacturers requirements SMACNA, NFPA 90A and 90B, UL listings and drawing details.

END OF SECTION 233300

SECTION 233713 - GRILLES, REGISTERS AND DIFFUSERS

PART 1 - GENERAL REQUIREMENTS (Reference Section 230500)

Provide where shown on plans grilles, registers, and diffusers. Refer to schedule on plans.

PART 2 – PRODUCTS

2.1 GRILLES, REGISTERS AND DIFFUSERS

A. Provide grilles, registers and diffusers as shown on the drawings and hereinafter specified. Set all units with rubber gaskets for air tight connection with mounting surface, see drawings for types, sizes, air flow and quantity.

B. Install all registers with curve of louver away from line of sight. Unless noted otherwise, provide duct mounted diffusers and registers with standard margins. Finish shall be off white when mounted in ceiling, prime coat when mounted on wall finish.

C. Provide proper mounting supplies and arrangements for areas shown. Check Architectural drawings for ceiling and all construction.

D. Equivalent by Titus, E.H. Price, Krueger, Louvers and Dampers, Greenheck.

2.2 INSTALLATION

A. Grilles, registers and diffusers shall be installed in accordance with SMACNA requirements, where balancing dampers are not provided in duct work preceeding diffusers, provide opposed blade balancing damper in neck of diffuser.

END OF SECTION 233713

SECTION 235000 – HEAT EXCHANGERS AND CONDENSATE RECEIVER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes shell-and-tube heat exchangers for heating of hydronic system hot water and steam condensate receivers with pumps.

1.3 SUBMITTALS

A. Product Data: Include rated capacities; shipping, installed and operating weights; furnished specialties; and accessories for each type of product indicated. Indicate dimensions, weights loads, and required clearances, method of field assembly, components and location and size of each field connection.

B. Maintenance Data: For heat exchangers and condensate receivers to include in maintenance manuals specified in Section 230500.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, performance and dimensional requirements of heat exchangers and are based on the specific equipment indicated.

B. ASME Compliance: Fabricate and label heat exchangers to comply with ASME Boiler and Pressure Vessel Code; Section VIII, “Pressure Vessels,” Division 1.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong Fluid Handling; Div. of Armstrong International, Inc.
2. ITT Fluit Handling; Div. of ITT Technology Corp.
3. Spirax Sarco
4. Hoffman
5. Dunham Bush

2.2 SHELL-AND-TUBE HEAT EXCHANGERS

A. Configuration: U-tube design with removable head on to facilitate cleaning.

B. Shell and Head Materials: Steel shell and fabricated-steel head.

C. Tube and Tube Sheet Materials: Seamless, ¾ inch OD copper tubes with steel tube sheets.

D. Piping Connections: Flanged-shell entry and threaded-shell fluid exit. Flanged-head ports.

2.3 CONDENSATE RECIEVER AND PUMPS

A. Provide as specified and as indicated in the schedule on the plans, as shown and detailed on the plans and in accordance with the manufacturer's instructions, duplex condensate receiver and pumps.

B. The unit shall consist of a tank with material and capacity as scheduled on the plans, a float operated control device with high water alarm contacts and close coupled pumps.

C. A sight glass shall be provided, service isolation valves for each pump shall be provided and a NEMA 4 control panel complete with alternator, pump starters, disconnect switches.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas for compliance with requirements for installation tolerances and for structural rigidity, strength, anchors and other conditions affecting performance of heat exchangers.

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

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections: Drawings indicate general arrangement of piping, fittings and specialties.

B. Maintain manufacturer's recommended clearances for service and maintenance. Install piping connection to allow service and maintenance.

C. Install piping with treaded or flanged connections as required.

D. Install shutoff valves at inlet and outlet connections as required and as indicated on the plans.

E. Install relief valves on heat exchanger heated-fluid connection.

F. Install vacuum breaker at heat exchanger steam inlet connection.

3.3 CLEANING

A. After completing system, installation, inspect exposed finish. Remove burrs, dirt and construction debris and repair damaged finishes.

3.4 COMMISSIONING

A. Verify that heat exchangers and condensate receiver are installed and connected according to the Contract Documents.

B. Adjust flows and controls to deliver specified performance.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain heat exchanger and condensate receiver as specified below:

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining heat exchangers.

2. Review data in maintenance manuals.

3. Schedule training with Authorized Representative with at least seven days advance notice.

END OF SECTION 235000

SECTION 237000 - HYDRONIC SYSTEM COILS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUBMITTALS

A. Product Data: Include performance characteristics and capacity, number of rows and fins configuration and spacing and accessories for each size of coil indicated.

B. Shop Drawings: Show layout and connections for coils.

C. Maintenance Data: For each type and size of pump specified to include in maintenance manuals specified in Division 1.

1.3 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, connections, and dimensional requirements of coils and are based on specific manufacturer types and models indicated. Other manufacturer's with equal performance characteristics may be considered.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect all coils against damage.

C. Comply with manufacturer's instructions for handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Coils:
   a. Trane
   b. Carrier

B. Coil shall be aluminum or copper plate fins and copper/copper alloy tubes. Fins shall have collars drawn, belled and firmly bonded to the tubes by means of mechanical expansion of the tubes.

C. Coil air flow arrow and nameplate shall be attached to the coil casing. Coil shall be certified in accordance with the AHRI Forced-Circulation Air-Cooling and Air-Heating Coils Certification Program based on AHRI Standard 410 within the Range of Standard Rating Conditions listed in Table 1 of the Standard.

D. Hot water coil shall be alternate-tube feed coil with 5/8" OD Tubes. Coil shall have supply header to ensure distribution of hot water to each tube of the coil. Coil shall be proof tested to a minimum of 300 PSIG and leak tested to 200 PSIG air pressure under water. Maximum working pressure shall be 200 PSIG.

E. Coil casing shall be manufactured of galvanized steel

F. Coil plate fins shall be aluminum Trane "PRIMA FLO H (hi-efficint) fin design

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of piping systems to verify actual locations of piping connections prior to installation.

3.2 INSTALLATION

A. Install coils according to manufacturer's written instructions.

B. Support piping so weight of piping is not supported by coils.

3.3 CONNECTIONS

A. Drawings indicate general arrangement of piping and specialties.

END OF SECTION 237000

SECTION 239500 - ARCHITECTURAL VERIFICATION

PART 1 - GENERAL (Reference Section 230500)

1.1 RELATED DOCUMENTS

A. Contractor shall consult all Architectural Drawings and specifications in their entirety incorporating and certifying all millwork, furniture, and equipment rough-in including utility characteristics such as voltage, phase, amperage, pipe sizes, duct sizes, including height, location and orientation. Shop drawings incorporating these requirements should be submitted to the Architect for approval prior to installation or rough-in.

END OF SECTION 239500

END OF DIVISION 23

SECTION 23 9100 – HVAC INSTRUMENTATION AND CONTROLS

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.

B. System commissioning is a part of the construction process. Documentation and testing of systems, as well as training of the Owner's operation and maintenance personnel, is required. Final Completion is dependent on successful completion of all commissioning procedures, documentation, and issue closure.

1.2 SYSTEM DESCRIPTION

A. Provide additions to the existing Control Systems as indicated on plans. These additions shall be by Honeywell Controls, "Honeywell Enterprise Buildings Integrator TM" (EBI). The system shall be complete in all respects including labor, materials, equipment, and services necessary, and shall be installed by personnel regularly employed by Honeywell Controls.

B. All automation and control components shall be integrated into a distributed network system communicating over a nonproprietary local area network. This system shall consist of field Stand-alone Direct Digital Controllers (DDC), Smart Local DDC's and interface into existing PC based operator workstations.

1.3 SEQUENCE OF OPERATION (SEE PLANS)

1.4 SUBMITTALS

A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.

1. Each control device labeled with setting or adjustable range of control.

B. Shop Drawings: Detail equipment assemblies for each DDC and/or pneumatic control system and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices. Included shall be diagrams depicting the system architecture complete with a communications riser.
2. Wiring Diagrams: Power, signal, and point-to-point control wiring diagrams. Differentiate between manufacturer-installed and field-installed wiring.
3. Details of control panel faces, including controls, instruments, and labeling.
4. Written description of sequence of operation.
5. Schedule of dampers including size, leakage, and flow characteristics.
6. Schedule of valves including leakage and flow characteristics.
7. Trunk cable schematic showing programmable control unit locations and trunk data conductors.
8. Listing of connected data points, including connected control unit and input device.

9. System graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.
10. System configuration showing peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.

C. ANSI/ASHRAE 135 BACnet Statement: PICS for each DDC system component (panel, zone controller (at VAV terminals), field devices, and operator workstation) proposed.

D. Samples: For each color required, of each type of thermostat cover.

E. Software and Firmware Operational Documentation: Include the following:

1. Software operating and upgrade manuals.
2. Program Software Backup: On a magnetic media or compact disc, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.
5. Software license required by and installed for DDC workstations and control systems. All software shall be licensed in the name of the Owner.

F. Software Upgrade Kit: For Authorized Representative to use in modifying software to suit future power system revisions or monitoring and control revisions.

G. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

H. Maintenance Data: For systems to include in maintenance manuals specified in Division 1. Include the following:

1. Maintenance instructions and lists of spare parts for each type of control device.
2. Interconnection wiring diagrams with identified and numbered system components and devices.
3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
5. Calibration records and list of set points.

I. Qualification Data: For firms and persons specified in “Quality Assurance” Article.

J. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. Revise Shop Drawings to reflect actual installation and operating sequences.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is a certified installer of the BAS control system manufacturer for both installation and maintenance of units required for this Project and shall include all necessary debugging and calibration of each component of the system.

B. Manufacturer Qualifications: A firm experienced in manufacturing automatic temperature-control systems similar to those indicated for this Project and with a record of successful in-service performance. Equipment and Installer shall have a support facility within 100 miles of the site with technical support staff, spare parts inventory and all necessary test and diagnostic equipment.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Underwriters Laboratory (UL 916).

E. FCC Regulation, Part 15, Section 156.

F. National Electric Manufacturers Associations (NEMA).

G. Building Officials and Code Administrator's International (BOCA) Mechanical Code.

H. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilation Systems."

I. Comply with ASHRAE 135 for DDC system control components.

J. Year-2000 Compliant: Computer hardware and software shall be capable of accurately processing, providing, and receiving date data from, into, and between the twentieth and twenty-first centuries, including leap-year calculations.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to unit manufacturer.

1.7 COORDINATION

A. Coordinate location of thermostats, and other exposed control sensors with plans and room details before installation.

B. Coordinate supply of conditioned electrical circuits for control units and operator workstation.

1.8 ELECTRICAL WORK FOR CONTROLS:

1. All electrical work for automatic controls, except as otherwise specified, or shown on the electrical drawings shall be included.

2. Electrical work shall, in general, comply with the following:

   a. All low voltage wiring in finished rooms shall be concealed
   b. Electrical work may include both line voltage and low voltage wiring, as required.
   c. Conduit network from power systems may be used for running control high voltage wiring.
   d. All electrical work shall comply with the NEC and the local electrical codes.
   e. All safety devices shall be wired through both hand and auto positions of motor starting device to insure 100% safety shut-off.
   f. All magnetic starters furnished by Electrical Contractor for mechanical equipment shall be furnished with integral control transformers, sized to handle the additional VA needed for the controls – pilots, EP valves, etc.
   g. The motor starter supplier shall provide auxiliary contacts as required for interlock by BACS Contractor, the supplier shall estimate an allowance of at least one auxiliary contract per starter. All interlock and control wiring shown on the electrical prints is by the electrical subcontractor.

1.9 GUARANTEE

A. All components, parts and assemblies shall be guaranteed against defects in material and workmanship for a period of one year after acceptance. Expressed warranties are conditionally based on the requirement that the items covered within the guarantee are used and maintained in accordance with the manufacturer's recommendations. Guarantee commences at the time of acceptance and continues for the previously indicated duration. Individual or aggregate beneficial use shall bean that the Owner's operators are able to use the System and receive reliable information from inputs and outputs completed by the Building Automation Contractor.

B. The following procedures shall govern the guarantee period. Within thirty (30) days after the Owner is receiving beneficial use of approved operation, the Building Automation Contractor shall initiate the guarantee period by formally transmitting to the Owner commencement notification of the period of the system(s), subsystem(s) and devices previously accepted. Guarantee notification will be formally transmitted in like manner for subsequent phases or portions thereof which remain incomplete at the time of initial notification.

1.10 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Replacement Materials: One replacement diaphragm or relay mechanism for each unique valve motor, controller, thermostat and positioning relay.

C. Spare points on individual controllers will not be required; however, the entire system must have the ability to be expanded in the future through the addition of application specific controllers.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide products compatible with existing automatic temperature controls and as required for a complete and functional system as indicated on plans.

2.2 STATUS AND SAFETY SWITCHES

A. General Requirements

1. Switches shall be provided to monitor equipment status, safety conditions, and generate alarms at the FMS 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.

B. Current Sensing Switches

1. 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.
2. Current sensing switches shall be used for run status for fans, pumps, and other miscellaneous motor loads.
3. 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.

C. Air Flow Switches

1. 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.

2.3 HVAC OUTPUT DEVICES

A. Actuators

1. General Requirements

a. Damper and valve actuators shall be electronic.

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 sequences 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, consume no more than 15 VA, and 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 sequences of operations as "quick acting," shall move full stroke within 20 seconds. All smoke damper actuators shall be quick acting.
e. Acceptable manufacturers: Johnson Controls, Belimo

3. Electronic Valve Actuators

a. Electronic valve actuators shall be manufactured by the valve manufacturer.
b. Each actuator shall have current limiting circuitry incorporated in its design to prevent damage to the actuator.
c. Modulating and two-position actuators shall be provided as required by the sequence of operations. Actuators shall provide the minimum torque required for proper valve close-off against the system pressure for the required application. The valve actuator shall be sized based on valve manufacturer's recommendations for flow and pressure differential. All actuators shall fail in the last position unless specified with mechanical spring return in the

sequence of operations. The spring return feature shall permit normally open or normally closed positions of the valves, as required. All direct shaft mount rotational actuators shall have external adjustable stops to limit the travel in either direction.

d. Modulating Actuators shall accept 24 VAC or VDC and 120 VAC power supply and 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 each valve actuator (except terminal valves) shall be wired back to a terminal strip in the control panel for trouble-shooting purposes.

B. Control Dampers

1. The FMS Contractor shall furnish all automatic dampers. All automatic dampers shall be sized for the application by the FMS Contractor or as specifically indicated on the Drawings.
2. All dampers used for throttling airflow shall be of the opposed blade type arranged for normally open or normally closed operation, as required. The damper is to be sized so that, when wide open, the pressure drop is a sufficient amount of its close-off pressure drop to shift the characteristic curve to near linear.
3. All dampers used for two-position, open/close control shall be parallel blade type arranged for normally open or closed operation, as required.
4. Damper frames and blades shall be constructed of either galvanized steel or aluminum. Maximum blade length in any section shall be 48". Damper blades shall be 16-gauge minimum and shall not exceed six (6) inches in width. Damper frames shall be 16-gauge minimum hat channel type with corner bracing. Additional stiffening or bracing shall be provided for any section exceeding 48" in height. All damper bearings shall be made of stainless steel or oil-impregnated bronze. Dampers shall be tight closing, low leakage type, with synthetic elastomer seals on the blade edges and flexible stainless steel side seals. Dampers of 48" x 48" size shall not leak in excess of 8.5 cfm per square foot when closed against 4" w.g. static pressure when tested in accordance with AMCA Std. 500.
5. Air foil blade dampers of double skin construction with linkage out of the air stream shall be used whenever the damper face velocity exceeds 1500 FPM or system pressure exceeds 2.5" w.g., but no more than 4000 FPM or 6" w.g. Acceptable manufacturers are Johnson Controls D-1300, Ruskin CD50, and Vent Products 5650.
6. One piece rolled blade dampers with exposed or concealed linkage may be used with face velocities of 1500 FPM or below.
7. Acceptable manufacturers are: Johnson Controls D-1100, Ruskin CD36, and Vent Products 5800.
8. Multiple section dampers may be jack-shafted to allow mounting of direct connect electronic actuators. Each end of the jack shaft shall receive at least one actuator to reduce jack shaft twist.

C. Control Relays

1. Control Pilot Relays

a. Control pilot relays shall be of a modular plug-in design with retaining springs or clips.
b. Mounting bases shall be snap-mount.
c. DPDT, 3PDT, or 4PDT relays shall be provided, as appropriate for application.
d. Contacts shall be rated for 10 amps at 120VAC.
e. Relays shall have an integral indicator light and check button.

D. Control Valves

1. All automatic control valves shall be fully proportioning and provide near linear heat transfer control. The valves shall be quiet in operation and fail-safe open, closed, or in their last position. All valves shall operate in sequence with another valve when required by the sequence of operations. All

   control valves shall be sized by the control manufacturer, and shall be guaranteed to meet the heating and cooling loads, as specified. All control valves shall be suitable for the system flow conditions and close against the differential pressures involved. Body pressure rating and connection type (sweat, screwed, or flanged) shall conform to the pipe schedule elsewhere in this Specification.
2. Chilled water control valves shall be modulating plug, ball, and/or butterfly, as required by the specific application. Modulating water valves shall be sized per manufacturer's recommendations for the given application. In general, valves (2 or 3-way) serving variable flow air handling unit coils shall be sized for a pressure drop equal to the actual coil pressure drop, but no less than 5 PSI.
3. Modulating plug water valves of the single-seat type with equal percentage flow characteristics shall be used for all hot and chilled water applications, except those described hereinafter. The valve discs shall be composition type. Valve stems shall be stainless steel.
4. Ball or Globe valves shall be acceptable for water terminal reheat coils, radiant panels, unit heaters, package air conditioning units, and fan coil units.

   a. Globe Valves NPS 2 and Smaller: Bronze body, bronze trim, rising stem, renewable composition disc, and screwed ends with backseating capacity replaceable under pressure.
   b. Globe Valves NPS 2 ½" and Larger: Iron body, bronze trim, rising stem, plug-type disc, flanged ends, and renewable seat and disc
   c. Hydronic system globe valves shall have the following characteristics:

      1) Rating: Class 125 for service at 125 psig and 250 degrees F operating conditions.
      2) Internal Construction: Replaceable plugs and seats of stainless steel or brass. Single-seated valves with cage trim provides seating and guiding surfaces for plug on top and bottom of guide plugs. Double-seated valves with balancing plug; caged trim provides seating and guiding surfaces for plugs on top and bottom of guided plugs.

   d. Sizing: 3-psig maximum pressure drop at design flow rate.
   e. Flow characteristics: Two-way valves shall have equal percentage characteristics. Operators shall close valves against pump shutoff head.

E. Electronic Signal Isolation Transducers

1. A signal isolation transducer shall be provided whenever an analog output signal from the Facility Management 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.

2.4 HVAC MISCELLANEOUS DEVICES

A. Local Control Panels

1. All control panels shall be factory constructed, incorporating the FMS 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 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%, 60Hz.
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.

2.5 CONTROL CABLE

A. Electronic and Fiber-Optic Cable for Control Wiring: As required and as specified here-in.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that conditioned power supply is available to control units.

B. Verify that duct-, pipe-, and equipment-mounted devices and wiring are installed before proceeding with installation.

3.2 INSTALLATION

A. Install equipment level and plumb.

B. Install software in control unit. Implement all features of programs to specified requirements and as appropriate to sequence of operation.

C. Connect and configure equipment and software to achieve sequence of operation specified.

D. Verify location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation. Locate all 60 inches above the floor.

1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install raceways, boxes, and cabinets according to Division 26 Section “Raceways and Boxes.”

B. Install building wire and cable and signal and communication cable according to Division 26 and as required to be fully NEC compliant

C. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.

D. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

3.4 FIELD QUALITY CONTROL

A. Manufacturer’s Field Service: A factory-authorized service representative shall inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove malfunctioning units, replace with new units, and retest.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment, and retest.
3. Calibration test electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.

B. Engage a factory-authorized service representative to perform startup service.

C. Replace damaged or malfunctioning controls and equipment.

1. Start, test, and adjust control systems.
2. Demonstrate compliance with requirements, including calibration and testing, and control sequences.
3. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified.

D. Verify DDC as follows:

1. Verify software including automatic restart, control sequences, scheduling, reset controls, and occupied/unoccupied cycles.
2. Verify operation of operator workstation.
3. Verify local control units including self-diagnostics.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Authorized Representative’s maintenance personnel to adjust, operate, and maintain control systems and components.

1. Train Authorized Representative's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
2. Provide operator training on data display, alarm and status descriptors, requesting data, executing commands, calibrating and adjusting devices, resetting default values, and requesting logs.
3. Review data in maintenance manuals.
4. Schedule training with Authorized Representative, through Architect, with at least seven days' advance notice.

END OF SECTION 23 9100

SECTION 260500 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 CONTRACT DOCUMENTS

A. All contract documents including drawings, alternates, addenda and modifications preceding this division of this specification are applicable to contractors, subcontractors, and material suppliers.

1.2 SPECIFICATION FORM AND DEFINITIONS

A. These Specifications are abbreviated form and contain incomplete sentences. Omissions of words or phrases such as "the contractor shall", "shall be", "as noted on the Drawings", "according to the drawings", "a", "an", "the" and "all" are intentional. Omitted words and phrases shall be supplied by inference.

B. The term “Engineer”, "Engineer", or “Engineer” wherever used in these specifications, shall mean LATIMER, SOMMERS & ASSOCIATES, P.A., 3639 SW SUMMERFIELD DRIVE, SUITE A, TOPEKA, KANSAS 66614, PHONE 785-233-3232, FAX 785-233-0647.

C. Contractor, wherever used in these specifications, shall mean the Company that enters into contract with Owner to perform this work.

D. When a word, such as "proper", "satisfactory", "equivalent", and "as directed", is used, it requires Engineer's review.

E. "Provide" means furnish and install.

F. Engineer hereinafter abbreviated A/E shall mean both the Design Engineers and the Design Engineers.

G. Equipment and/or materials manufacturer hereinafter abbreviated E/M shall mean the manufacturer of equipment or materials specified or referred to.

H. When the term “equivalent” is used in context to products or manufacturer’s, the equivalency of the proposed product or manufacturer to be used in lieu of the specified product or manufacturer is the sole decision of the A/E.

1.3 SUPERVISION

A. The contractor shall employ an experienced, competent and adequate work force licensed in their specific trade and properly supervised at all times.

B. Unlicensed workers and general laborers shall be adequately supervised to insure competent and quality work and workmanship required by this contract and all other regulations, codes and practices.

C. A “Foreman” shall be present during all work activity required to complete the project. “foreman” shall be an individual who has received appropriate training from a recognized training organization and who has adequate experience in the supervision of similar workforce. The qualification statement of the “Foreman” shall be submitted and approved by the Engineer prior to the start of work.

D. "Master" and "Journeyman" shall be individuals who have received appropriate training, and experience and who have taken and passed the appropriate tests as administered by a recognized testing agency. The qualifications of all "Master" and "Journeyman" tradesmen shall be submitted and approved by the Engineer prior to the start of work.

E. "Apprentice" shall be an individual who is currently in a recognized training program I the particular trade the express purpose of which is to result in the individual becoming licensed as a "Journeyman" in that trade? This individual shall be supervised at all times installation work is being completed.

F. "Laborer" or "Helper" shall be an individual who provides support of each the "Master," "Journeyman" and "Apprentice." This individual shall not perform any unsupervised installation.

G. The make up of the workforce shall be in the following ratio:

1. Master -1
2. Journeyman – 2 or more
3. Apprentice -1
4. Helper -1

Note that a "Master" can serve as a "Journeyman."

1.4 LOCAL CONDITIONS

A. Visit site and determine existing local conditions affecting work in contract.

B. Failure to determine site conditions or nature of existing or new construction will not be considered a basis for granting additional compensation.

1.5 CONTRACT CHANGES

A. Changes or deviations from Contract, including those for extra or additional work must be submitted in writing for review of Engineer. No verbal orders will be recognized.

1.6 LOCATIONS AND INTERFERENCES

A. Location of equipment, piping and other mechanical work is indicated diagrammatically on the Drawings. Determine exact locations on job, subject to structural conditions, work of other sections of the Specifications, access requirements for installation and maintenance and approval of Engineer.

B. Study and become familiar with the Drawings of other trades and in particular the general construction plans and details in order to obtain necessary information for figuring installation. Cooperate with work of other trades, and install work in such a way as to avoid interference with work of other trades. Minor deviations, not affecting design characteristics, performance or space limitation may be permitted if reviewed by Engineer prior to installation.

C. Any pipe, apparatus, appliance or other item interfering with proper placement of other work as indicated on Drawings, specified, or required, shall be removed and if so shown, relocated and reconnected without extra cost. Damage to new or existing work caused by Contractor shall be restored as specified for new work.

D. Do not scale Drawings for dimensions. Accurately lay-out work from dimensions indicated on Drawings unless such be found in error.

E. Report any conflict stated above to supervisor for coordination.

1.7 PERFORMANCE

A. Final acceptance of work shall be subject to the condition that all systems, equipment, apparatus and appliances operate satisfactorily as designed and intended. Work shall include required adjustment of systems and control equipment installed under this specification division.

1.8 WARRANTY

A. The plumbing systems are to be warranted to Owner and Engineer the quality of materials, equipment, workmanship and operation of equipment provided under this specification division for a period of one year from acceptance of electrical systems by Owner.

B. Contractor warrants to Owner and Engineer that on receipt of notice from either of them within one year of warranty period following date of acceptance all defects that have appeared in materials and/or workmanship, shall be promptly corrected to condition required by contract documents at contractor expense.

C. The warranty above expressed shall not supersede any separately stated warranty or requirements required by law or by these specifications.

1.9 ALTERNATES

A. Reference Architectural Specification.

PART 2 - PRODUCTS

2.1 MATERIALS, EQUIPMENT AND SUBSTITUTIONS

A. The intent of these specifications is to allow ample opportunity for bidder to use its ingenuity and abilities to perform the work to its and the Owner's best advantage, and to permit maximum competition in bidding on standards of materials and equipment required.

B. Material and equipment provided shall be first class quality, new, unused and without damage unless noted otherwise.

C. In general, these specifications identify required materials and equipment by naming first the manufacturer whose product was used as the basis for the project design and specifications. The manufacturer's product, series, model, catalog and/or identification numbers shall set quality and capacity requirements for comparing the equivalency of other manufacturer's products. Where other manufacturer’s names are listed they are considered an approved manufacturer for the product specified, however; the listing of their names implies no prior approval of any product they may propose to furnish as equivalent to the first named product unless specific model or catalog numbers are listed in these specifications or in subsequent addenda. Where other than first named products are used for base bid proposal it shall be the responsibility of the Contractor to determine prior to bid time that the proposed materials and equipment selections are products of approved manufacturers which meet or exceed the specifications and are acceptable to the Engineer.

D. Where materials or equipment are described but not named, provide required items of first quality, adequate in every respect for intended use. Such items shall be submitted to Engineer for review prior to procurement.

E. Prior to receipt of bids, if the Contractor wishes to incorporate products other than those named in the specifications or drawings they shall submit a request for approval of equivalency in writing to the A/E no later than (10) ten calendar days prior to bid date. Engineer will review requests and acceptable items will be listed in an Addendum issued to principal bidders. Equivalents will ONLY be considered approved when listed by project addendum. Substitutions after this may be refused at Engineers option.

F. Materials and equipment proposed for substitution shall be equal to or superior to that specified in construction, efficiency, utility, aesthetic design, and color as determined by Engineer whose decision shall be final and without further recourse. Physical size of substitute brand shall be no larger than space provided including allowances for access for installation and maintenance. Requests must be accompanied by two (2) copies of complete descriptive and technical data including manufacturer's name, model and catalog number, photographs or cuts, physical dimensions, operating characteristics and any other information needed for comparison. .In proposing a substitution prior to receipt of bids, include in such proposal cost of altering other elements of project, including adjustments in mechanical/electrical service requirements necessary to accommodate such substitution.

G. In proposing a substitution prior to receipt of bids, include in such bid all costs of altering other elements of the project, including such items as adjustments in mechanical/electrical service requirements necessary to accommodate such substitutions. In addition, all physical space and weight requirements requiring additional structural support, modifications to the base floor plans, equipment concrete pad/roof curb dimensions shall be incorporated as required into such bid to accommodate such substitutions.

H. Within ten (10) working days after bids are received, apparent low bidder shall submit to A/E for approval three copies of a list of all major items of equipment he intends to provide. As soon as practicable and within ten (10) working days after award of contract, Contractor shall submit shop drawings for equipment and materials to be incorporated in work for Engineer's review. Where ten (10) working day limit is insufficient for preparation of detailed shop drawings on major equipment or assemblies, Contractor shall submit manufacturer's descriptive catalog data and indicate date such detailed shop drawings will be submitted along with manufacturer's certifications that order was placed within ten (10) working day limit.

PART 3 - EXECUTION

3.1 SHOP DRAWINGS

A. Contractor shall furnish shop drawings of all materials and equipment. These shop drawings shall be submitted to the Engineer in electronic “PDF” format. A copy of fully processed product data submittal shall be included as a part of each operating and maintenance manual.

B. Where catalog cuts are submitted for review, conspicuously mark or provide schedule of equipment, capacities, controls, fitting sizes, etc., that are to be provided. Mark submitted item with applicable section and paragraph numbers of these specifications, or Drawing sheet number when item does not appear in specifications. Where equipment submitted does not appear in specifications or specified equivalent, mark submittals with applicable alternate numbers, change order number or letters of authorization. Each catalog sheet shall bear Equipment Manufacturer's name and address. All shop drawings on materials and equipment listed by UL shall indicate UL approval on submittal.

C. Contractor shall be required to submit all applicable equipment/material assembly mock-ups as required by the Contract Documents for Engineer approval. Contractor shall provide changes and resubmit mock-ups until Engineer is satisfied final product meets or exceeds stated specifications and quality of specified product.

D. Contractor shall check all shop drawings to verify that they meet specifications and/or drawings requirements before forwarding submittals to the Engineer for their review.

E. All shop drawings submitted to Engineer shall bear Contractor's approval stamp which shall indicate that Contractor has reviewed submittals and that they meet specification and drawing requirements. Contractor's submittal review shall specifically check for but not be limited to the following: equipment capacities, physical size in relation to space allowed, electrical characteristics, provisions for supply, return and drainage connections to building systems. All shop drawings not meeting Contractor's approval shall be returned to its supplier for resubmittal.

F. No shop drawing submittals will be considered for review by the Engineer without Contractor's approval stamp, or that have extensive changes made on the original submittal as a result of Contractor's review. All comments or minor notations on shop drawings shall be flagged to indicate originator of comment.

G. Engineer's review of shop drawings will not relieve Contractor of responsibility for deviations from drawings and specifications unless such deviations have been specifically approved in writing by Owner or its representative, nor shall it relieve Contractor of responsibility for errors in shop drawings. No work shall be fabricated until Engineer's review has been obtained with "no exceptions" or "as noted" language. Any time delay caused by correcting and resubmitting shop drawings will be Contractor's responsibility.

H. Contractor shall submit the following items for this project:

a. Conduit
b. Conductors
c. Disconnect Switches
d. Motor Control Switches
e. Fuses
f. Panelboards

3.2 SETTING, ADJUSTMENT AND EQUIPMENT SUPPORTS

A. Work shall include mounting, alignment and adjustment of systems and equipment. Set all equipment level on adequate supports and provide proper anchor bolts and isolation as shown or specified. Equipment failures resulting from improper installation or field alignment shall be repaired or replaced by Contractor at no cost to Owner.

B. Provide each piece of equipment or apparatus with suitable structural support, platform or carrier in accordance with best recognized practice. Contractor shall arrange for attachment to building structure, unless otherwise indicated on drawings or as specified. Provide hangers with vibration eliminators where required.

3.3 TESTS RECORDING AND REPORTING TESTS AND DATA

A. Record nameplate horsepower, amperes, volts, phase service factor and other necessary data on motors and other electrical equipment furnished and/or connected under this contract.

B. Record motor starter catalog number, size and rating and/or catalog number of thermal-overload units installed in all motor starters furnished and/or connected under this contract. See motor starter specification for instructions for proper sizing of thermal-overload units.

C. Record amperes-per0phase at normal or near-normal loading of each item of equipment furnished and/or connected.

D. Record correct readings of each feeder conductor after energized and normally loaded, and again after balancing of feeder loads as required by current readings.

E. Record voltage and ampere-per-phase readings taken at service entrance equipment after completion of project with building operating at normal electrical load.

F. Submit data noted above to Engineer, electronically, for review prior to final inspection.

G. Keep a record of all deviations made from routes, locations, circuiting, etc. shown on contract drawings. Prior to final inspection submit one new set of project drawings with all deviations and changes clearly indicated.

3.4 PRE-FINAL AND FINAL CONSTRUCTION REVIEW

A. At Contractor’s request, Engineer will make pre-final construction review to determine if to the best of its knowledge project is completed in accordance with Contract Documents.

B. Items found by Engineer as not complete or not in accordance with requirements of contract will be outlined in report to Engineer for forwarding to Subcontractors. Subcontractor shall complete and/or correct these items, before notifying Engineer it is ready for final review.

C. All necessary system adjustments, including air systems balancing, shall be completed and all specified records and reports submitted in sufficient time to be received by Engineer at least ten working days prior to date of final construction review.

D. At final construction review, Contractors shall be present or shall be represented by a person of authority. Each shall demonstrate, as directed by Engineer that work complies with purpose and intent of contract documents and shall provide labor, services, instruments or tools necessary for such demonstrations and tests.

END OF SECTION 260500

SECTION 260501 - EXTENT OF CONTRACT WORK AND CODES

PART 1 - GENERAL (Reference Section 260500)

1.1 GENERAL EXTENT OF WORK INCLUDED IN CONTRACT

A. Provide electrical systems indicated on drawings, specified or reasonably implied. Provide every device and accessory necessary for proper operation and completion of electrical systems. In no case will claims for "Extra Work" be allowed for work about which Contractor could have been informed before bids were taken.

B. Contractor shall be familiar with all equipment provided which requires electrical connections and control. Follow circuiting shown on drawings for lighting, power and equipment connections.

C. Make required electrical connections to equipment provided under this project. Receive and install electric control devices requiring field installation, wiring, and service connection.

D. Check electrical data and wiring diagrams with project voltages, wiring, controls and protective devices shown on electrical drawings. Promptly bring discrepancies found to attention of Engineer for a decision.

1.2 CODES, ORDINANCES, RULES AND REGULATIONS

A. Provide work in accordance with applicable rules, codes, ordinances and regulations of Local, State, Federal Governments, and other authorities having lawful jurisdiction.

B. Drawings and specifications indicate minimum construction standard, should any work indicated be sub-standard to any ordinances, laws, codes, rules or regulations bearing on work, Contractor shall promptly notify Engineer in writing before proceeding with work so that necessary changes can be made. However, if Contractor proceeds with work knowing it to be contrary to any ordinances, laws, rules, and regulations he shall thereby have assumed full responsibility for and shall bear all costs required to correct non-complying work.

C. Contractor shall secure and pay for necessary permits and certificates of inspection required by governmental ordinances, laws, rules or regulations. Keep a written record of all permits and inspection certificates and submit two copies to Engineer with request for final review.

D. Contractor shall include in bid any charges by local utility providers to establish new services to the structure. Coordinate with the utility suppliers to verify exact which part of the work is to be performed by whom.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 DRAWINGS

A. Drawings are to be considered diagrammatic for all systems. Conduit runs and circuiting do not show all required offsets and fittings. Contractor shall include in bid costs to provide systems which coordinate with all other building trades and systems.

B. Contractor may not share neutrals for multiple circuits, unless specifically noted as such on the drawings.

C. Homeruns may be grouped together. Contractor shall be responsible for properly sizing conduits where homeruns are grouped together per requirements of the National Electric Code.

END OF SECTION 26 0501

SECTION 260519 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Refer to Section 260500-Common Work Results for Electrical.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Unless noted otherwise conductors referred to are wires and cable. Provide code grade soft annealed copper conductors with specified insulation type in proper colors to conform with color coding specified. Provide conductors No. 10 gauge and larger stranded and conductors No. 12 gauge and smaller shall be solid.

B. Use no conductors smaller than No. 12 gauge unless specifically called for or approved by Engineer. Size wire for volt branch circuits for 3% maximum voltage drop. Size feeder circuits for 2% maximum voltage drop. Combined voltage drop of feeders and branch circuits shall not exceed 5% maximum.

C. Provide conductors for listed applications as follows:

1. Lighting and Receptacle Circuits: Type THWN, or THWN/THHN 600 volt, 75 degrees C (167^{o}F) thermoplastic insulated building conductor or better.
2. Lighting and Receptacles Circuits with No. 8 or larger conductors, motor circuits, power and feeder circuits and building service feeders: Type THHN/THWN 600 volts, 75 degrees C (167^{o}F) thermoplastic insulated building conductor.

D. Provide conductors by Essex, Capitol Southwire Rome, Senator or equivalent.

PART 3 - EXECUTION

3.1 CONDUCTOR INSTALLATION

A. Run conductors in conduit continuous between outlets and junction boxes with no splices or taps pulled into conduits.

B. Neatly route, tie and support conductors terminating at switchboards, motor control centers, panelboards, sound equipment, etc., with Thomas & Betts Ty-Rap cable ties and clamps or equivalent by Electrovert or Panduit.

C. Make circuit conductor splices with appropriately sized “wire nuts” Buchanan crimped-on solderless connectors and snap-on nylon insulators or equivalent.

D. Terminate solid conductors at equipment terminal strips and other similar terminal points with insulated solderless terminal connectors. Terminate all stranded conductor terminal points with insulated solderless terminal connectors. Provide Thomas & Betts Sta-Kon insulated terminals and connectors or equivalent by API/AMP, Blackburn, Buchanan or Scotchlok "Wire Nuts".

E. Where a total of six or more control and feeder conductors terminate in a multiple device panel or enclosure that has no built-in terminal blocks provide Buchanan 600 volt heavy duty Type HO sectional terminal blocks with mounting channel and No. 23 see-thru covers. Equivalent terminal blocks by General Electric, Square D or Westinghouse.

F. Wrap conductor taps and connections requiring additional insulation with a minimum of three overlapped layers of 3M scotch vinyl plastic electrical type No. 88 or equivalent.

G. Only one neutral may be used for each branch circuit. When additional circuits occur in a common conduit run, additional neutrals shall be installed to result in one neutral for each branch circuit. Contractors shall provide conduit/conductor sizes as required by Code for listed quantities of conductors.

3.2 CONDUCTOR COLOR CODING

A. Refer to 260553 "Identification for Electrical Systems."

3.3 IDENTIFICATION

A. Refer to 260553 "Identification for Electrical Systems."

END OF SECTION 260519

SECTION 260526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL (Reference Section 260500)

1.1 GENERAL REQUIREMENTS

A. Supplement grounded neutral of secondary distribution system with equipment grounding system, installed so that metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, portable equipment and other conductive items operate continuously at ground potential and provide low impedance path for ground fault currents.

B. System shall comply with National Electrical Code.

PART 2 – PRODUCTS (NOT USED)

PART 3 -EXECUTION

3.1 GROUNDING CONNECTIONS

A. Equipment grounding conductors for branch circuit home runs shown on the drawings shall indicate an individual and separate ground conductor for that branch circuit which shall be terminated at the branch circuit panelboard, switchboard, or other distribution equipment. No sharing of equipment grounding conductors sized according to the size of the overcurrent device shall be allowed.

B. Required equipment grounding conductors and straps shall be sized in compliance with National Electrical Code (NEC). Equipment grounding conductors shall be provided with green type TW 600 volt insulation. Related feeder and branch circuit grounding conductors shall be connected to ground bus with approved pressure connectors. Installation shall include necessary precautions regarding terminations with dissimilar metals.

C. Provide low voltage distribution system with a separate green insulated equipment grounding conductor for each raceway containing single or three-phase feeder. Single phase 120 volt branch circuits for lighting and power shall consist of phase and neutral conductors and a green ground conductor installed in common metallic conduit which shall serve as grounding conductor. Provide flexible metallic conduit utilized in conjunction with above single phase branch circuits with suitable green insulated grounding conductors connected to approved grounding terminals at each end of flexible conduit. Single phase branch circuit installed in nonmetallic conduits shall be provided with separate grounding conductor. Install grounding conductor in common conduit with related phase and/or neutral conductors.

D. Where parallel feeders are installed in more than one raceway, each raceway shall have a green insulated equipment grounding conductor.

E. Provide steel and aluminum conduits which terminate without mechanical connection to metallic housing of electrical equipment with ground bushing and connect each bushing with bare copper conductor to ground bus in electrical equipment. Electrically non-continuous metallic conduits containing ground wiring only shall be bonded to ground wire at both conduit entrance and exit

F. Grounding conductors shall be as shown on plans or if not specifically shown shall be no smaller than that required by the NEC.

END OF SECTION 260526

SECTION 260529 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Refer to Section 260500-Common Work Results for Electrical.

PART 2 – PRODUCTS (NOT USED0

PART 3 - EXECUTION

3.1 INSERTS, HANGERS

A. Support vertical and horizontal conduit runs at intervals not greater than 10 feet, within 3 feet of any bend and at every outlet or junction box

B. Install multiple runs of conduits as follows:

1. Where a number of conduits are to be run exposed and parallel, group and support with trapeze hangers.
2. Fasten hanger rods to structural steel members with suitable beam clamps and to concrete structures with inserts set flush with surface. Install concrete inserts with reinforced rod through opening provided in inserts.
3. Inserts shall be Grinnell figure 279, 281, 282, or 285 or equivalent as required by load and concrete thickness.
4. Provide beam clamps suitable for structural members and conditions.
5. Provide 3/8" minimum diameter steel hangers rods galvanized or cadmium plated finish.
6. Trapeze hangers shall be Kindorf Series 900 channel with fittings and accessories as required.
7. Attach each conduit to trapeze hanger with Steel City No. C-105 clamps for rigid conduit and Steel City No. C-106 clamps for electrical metallic tubing. (EMT)

C. Install clamps for single conduit runs as follows:

1. Support individual runs by approved pipe straps, secured by toggle bolts on hollow masonry; expansion shields and machine screws or standard preset inserts on concrete or solid masonry; machine screws or bolts on metal surfaces; and wood screws on wood construction. Use of perforated strap not permitted.
2. Install exposed conduits in damp locations with clamp backs under each conduit clamp to prevent accumulation of moisture around conduits.
3. Provide inserts, hangers and accessories with finish as follows:

a. Galvanized: Concrete inserts and pipe straps.
b. Galvanized or Cadmium Plated: Steel bolts, nuts, washers and screws.
c. Painted with Prime Coat: Individual hangers, trapeze hangers and rods.

D. Equivalent hangers and support systems by Binkley, Fee and Mason, Kin-Line or Unistrut.

END OF SECTION 260529.

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Refer to Section 260500-Common Work Results for Electrical.

PART 2 - PRODUCTS

2.1 STEEL CONDUIT

A. EMT Conduit: Conduit shall be galvanized steel electrical metallic tubing and bear and Underwriters' Laboratory label. Conduit shall conform to Federal Specification WWC-563 and ANSI specification C80.3.

B. Unless specifically indicated on plans, contractor may use EMT for all above grade main feeder circuits to switchboards and panelboards.

C. Liquid tight flexible metal conduit Type LFMC: Liquid tight flexible metal conduit shall be used for final connection to motors or equipment where vibration may be encountered. A maximum length of 6'-0" shall be used. A grounding conductor shall be installed in all conduits to include liquid tight flexible metal conduit. Transition from either EMT conduit to liquid tight flexible metal conduit shall be made by use of a NEMA 3R junction box. Liquid tight flexible metal conduit shall be installed as indicated in NEC Article 350.

2.2 CONDUIT FITTINGS

A. EMT Conduit: Couplings and box connectors shall be die cast set screw type. Unilets shall be malleable iron with blank cover.

B. Flexible Conduit: Connectors shall be threaded type iron with insulated throat.

C. Provide grounding bushings where feeder conduit attaches to panelboard backbox. Bond grounding bushing to ground bus.

2.3 OUTLET BOXES

A. Provide electrical service outlets, including plug receptacles, with Steel City, Raco, or equivalent four inch code gauge steel knockout boxes galvanized or sheradized of required depth for service or device.

B Use no sectional outlet boxes.

PART 3 - EXECUTION

3.1 CONDUIT INSTALLATION

A. Align conduit terminations at panelboards, switchboards, motor control equipment, junction boxes, etc. and install true and plumb. Provide supports or templates to hold conduit alignment during rough-in stage of work.

B. Install conduit continuous between outlet boxes, cabinets and equipment. Make bends smooth and even without flattening or flaking conduit. Radius of bends shall not be shorter than radius listed table 346-10 (b) of NEC. Long radius elbows may be used where necessary.

C. Ream and clean conduit before installation and plug or cover openings and boxes to keep conduit clean during construction.

D. Install no conduits or other raceways sized smaller than permitted in applicable NEC Tables. Where conduit sizes shown on drawings are smaller than permitted by code, Contractor shall include cost for proper size conduit in his base bid. In no case reduce conduit sizes indicated on drawings or specified without written approval of Engineer. Fasten conduit securely in place with approved straps, hangers, and steel supports. Provide O-Z cable support to support conductors in vertical raceways as required by NEC Table 300-19 (a) of NEC.

E. All flexible conduit shall be securely supported independent of a box connector or other coupling.

F. Low voltage wiring including fire alarm, telephone, television, computer cabling and other low voltage wiring shall be installed in conduit unless noted otherwise.

3.2 BUSHINGS AND LOCKNUTS

A. Enter outlet boxes squarely and securely clamp conduit to outlet box with bushing on inside and locknut on outside.

END OF SECTION 26 0533

SECTION 260553 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL (Reference Section 260500)

1.1 IDENTIFICATION OF WIRING AND EQUIPMENT

A. Provide identification and warning signs to wiring and equipment as listed in schedule. Signs and tags shall be as follows:

TYPE 1: Laminated phenolic plastic with black Gothic condensed lettering by Seton or Wilco.
TYPE 2: Self-sticking ½" wide plastic tape with high gloss surface and embossed lettering by Brady or Dymo.
TYPE 3: Self-sticking flexible vinyl with oil resistant adhesive for -20 degrees to 300 degrees F. temperatures by Brady or as approved.

B. Provide lighting and power panelboards with Type 1 sign minimum of 1-1/4" x 6" indicating panel designation and electrical characteristics. Mount inside of panel door on circuit breaker trim flange just below breakers.

C. Provide disconnect switches/motor starters with Type 1 sign 3/4" x 5" indicating equipment served and Brady No. AE-46125 danger sign.

D. Provide feeders and branch circuit home runs with Type 3 wire marker indicating circuit number and power source. Provide feeders phase identification letter at each terminal point in addition to its circuit number. Provide label designating area and room number(s) served on inside of panelboard door for each circuit used.

E. Provide Type 2 tape at feeder terminal lugs to switchboards and panelboards. Tape shall indicate conduit size, conductor type and AWG size. Tape shall be located to be easily read with conductors installed.

F. All wires for branch circuit work shall be color coded as follows:

1. Provide continuous color coding for feeder, branch and control circuits. Insulation or identification tape color shall be same color for like circuits throughout. Where specified insulation colors are not available in larger wire sizes color code conductor at all accessible location with Scotch 35 all-weather color code tape.
2. Identify the same phase conductor with same color throughout.
3. Provide conductors with color coding in accordance with NEC. Where more than one standard voltage system is installed, provide same colored conductors with indicated tape or stripe to indicate system voltage.

Phase	208/120	480/277
A	BLACK	BROWN
B	RED	ORANGE
C	BLUE	YELLOW
NEUTRAL	WHITE	WHITE
GROUND	GREEN	GREEN

G. Use solid color coating for No. 6 and smaller branch circuit conductors and neutral conductors.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 260553

SECTION 262416 – PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes branch circuit power panelboards and associated auxiliary equipment rated 600 V or less.

1.3 SUBMITTALS

A. Refer to 260500 Common Work Results for Electrical

B. Product data for each type panelboard, accessory item, and component specified.

C. Shop drawings from manufacturers of panelboards including dimensioned plans, sections, and elevations. Show tabulations of installed devices, features, accessories, current rating, and voltage rating. Include the following:

1. Enclosure type with details for types other than NEMA Type 1.
2. Bus configuration and current ratings.
3. Short-circuit current rating of panelboard and protective devices.
4. Features, characteristics, ratings, and factory settings of individual protective devices and auxiliary components.
5. Time-current data curves for protective devices.

D. Wiring diagrams detailing schematic diagram including control wiring, and differentiating between manufacturer-installed and field-installed wiring.

E. Panel schedules for installation in panelboards. Submit final versions after load balancing.

F. Maintenance data for panelboard components, for inclusion in Operating and Maintenance Manual specified in Division 1 and in Section 16050 – Basic Electrical Materials and Methods. Include instructions for testing circuit breakers.

G. Test data forms.

1.4 QUALITY ASSURANCE

A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The terms “listed” and “labeled” shall be defined as they are in the National Electrical Code, Article 100.

B. Electrical Component Standard: Components and installation shall comply with NFPA 70, “National Electrical Code.”

C. NEMA Standard: Comply with NEMA PB1, “Panelboards.”

D. UL Standards: Comply with UL 61, “Panelboards,” and UL 50, “Cabinets and Boxes.”

1.5 EXTRA MATERIALS

A. Keys: Furnish 10 spares for panelboard cabinet locks.

B. Touch-up Paint for surface-mounted panelboards: One half-pint container.

C. Obtain the Owner-signed receipt for all extra materials. Provide a copy of the receipt to the Architect.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Design is based on products as supplied by Square D. No equivalents allowed.

2.2 PANELBOARDS

A. Provide panelboards and auxiliary components of types, sizes, and ratings indicated and that comply with manufacturer’s standard materials, design, and construction in accordance with published product information, unless indicated otherwise. Series rated devices, equipment and assemblies shall not be provided. IEC rated devices, equipment and assemblies shall not be provided. All rated devices, equipment, and assemblies shall be NEMA rated. All buses shall be silver plated copper. All connections shall be tightly bolted. AIC shall be as indicated on the drawings or elsewhere herein.

B. Branch Circuit Breaker Panelboards
1. Circuit breaker panelboards shall be dead-front safety type as indicated, with bolt-on to bus molded case circuit breakers in quantities, ratings, types and arrangement indicated.
2. Provide anti-turn solderless pressure type lug connectors approved for copper conductors on all circuit breakers and bus bars.
3. All connectors shall be listed for 75 degrees C. All bus bars shall be hard drawn silver plated copper of 98 percent conductivity.
4. Provide full size neutral bus.
5. Where noted on the drawings, provide 200 percent neutral bus.
6. Provide ground bus. additionally provide isolated ground bus for isolated ground type panelboards.
7. Provide circuit breakers with toggle handles that indicate when tripped. Provide common trip on multiple pole circuit breakers so overload on one pole will trip all poles simultaneously. Provide 20 ampere, single-pole circuit breakers listed as type SWD. Provide circuit breakers listed as type HACR as required.
8. Select enclosures and front trims fabricated by same manufacturer as panelboard and that mate properly with panelboards.
9. Panelboard enclosures shall be fabricated of code-gauge, minimum 16-gauge thickness, galvanized sheet steel unless required to be of other type of material to meet NEMA type as indicated. Provide enclosures without knock-outs.
10. Provide hinged cover front trims of door-in-door design and hinged door with flush key lock. All locks shall be keyed alike. Provide 4 extra keys. Provide front with interior circuit directory frame and directory card with clear plastic cover.

C. The equipment shall have adequate quantity of lugs to terminate the quantity and size of conductors as shown on the Drawings. Lugs shall be suitable for type, size, and quantity of conductors to be used as shown on the Drawings and/or as specified elsewhere in these specifications.

D. 208Y/120V branch circuit panelboards shall be Square D NQOD and fully rated at 10,000 AIC minimum, including all breakers, unless otherwise noted on the drawing or here-in.

2.3 IDENTIFICATION

A. Refer to Section 260553 –Identification for Electrical Systems.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install branch circuit breaker panelboards and accessory items in accordance with NEMA PB 1.1, “General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less” and manufacturer’s written installation instructions.

B. Mounting Heights: Top of box 6'-6" above finished floor, except as indicated.

C. Mounting: Plumb and rigid without distortion of box. Mount flush panels uniformly flush with wall finish.

D. Circuit Directory: Typed and reflective of final circuit changes required to balance panel loads. Obtain approval prior to typing and installing.

E. Install filler plates in unused spaces.

3.2 IDENTIFICATION

A. Refer to Section 260553 –Identification for Electrical Systems.

3.3 GROUNDING

A. Refer to Section 260526-Grounding.

B. Connections: Make equipment grounding connection(s) for switchboards and panelboards unless indicated otherwise.

C. Provide ground continuity to main electrical ground bus or buses unless indicated otherwise.

D. Provide ground bushing with proper bonding to ground bar on all conduits connect to switchboard and panelboard back boxes.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals, including grounding connections, in accordance with manufacturer’s published torque-tightening values. Where manufacturer’s torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each switchboard and panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Testing: After installing switchboard and panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Balancing Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes as follows:

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerances: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

D. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchboard and panelboard. Remove panel fronts so joints and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchboard and panelboard 11 months after date of Substantial Completion.
2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies switchboard or panelboards checked and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

E. Test data documentation shall be provided to the Commissioning Consultant.

3.6 CLEANING

A. Upon completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

3.7 COMMISSIONING

A. Balancing Loads: After Final Acceptance, conduct load-balancing measurements and circuit changes as follows:

1. Perform measurements during period of normal working load as advised by the Owner. The Owner to determine available test dates.

2. Perform load-balancing circuit changes outside the normal occupancy/working schedule of the facility. Make special arrangements with the Owner to avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. Recheck loads after circuit changes during normal load period. Record all load readings before and after changes and submit test records to the Associate.
4. Tolerance: Difference between phase loads exceeding 20 percent at any one panelboard is not acceptable. Re-balance and recheck as required to meet this minimum requirement.
5. Provide all other work and material associated with the commissioning. Work and material includes, but is not limited to, identification, wiring, and testing.

B. Provide a written statement to the Engineer that all commissioning work has been performed per the requirements of the contract documents.

3.8 DEMONSTRATION

A. Refer to Section 017900-Demonstration and Training.

END OF SECTION 262416

SECTION 262816 - DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Refer to Section 260500-Common Work Results for Electrical.

1.3 QUALITY ASSURANCE

A. Electrical Component Standard: Components and installation shall comply with NFPA 70 “National Electrical Code.”

1.4 MANUFACTURERS

A. Manufacturers: The product shall be as manufactured by Square D Company, Schneider Electric.

B. Equivalent by GE, Siemen’s.

PART 2 - PRODUCTS

2.2 DISCONNECT SWITCHES

A. Provide heavy duty horsepower rated Safety Switches rated in accordance with NEMA enclosed Switch Standard KS 1-1969 and L98 Standard.

B. Enclosure shall be NEMA type required by switch location and environment. Enclosure door shall latch with means for padlocking and cover interlock with defeater to prevent opening door when switch is energized or closing switch with door open. Switch shall have an embossed nameplate permanently attached to door front with switch rating, short circuit interrupting capacity and application information.

C. Line terminals shall be permanently marked and shielded. Contact shall be tin plated, equipped with arch chutes and have moving contacts visible in off position with door open. Wiring terminals shall be pressure type suitable for copper or aluminum wire. Switching mechanism shall be quick-make, quick-break spring driven anti-tease mechanism and shall be integral part of box. All current carrying parts shall be plated.

D. Fuse holders shall be high pressure suitable for use with dual element fuses or rejection type current limiting fuses where required. Fuse holders shall be completely accessible from front of switch and fuses shall be installed so that the label may be easily read from the front and without removing the fuse.

E. All fuse holders for rejection type current limiting fuses shall have rejection clips installed.

PART 3 - EXECUTION

3.2 INSTALLATION

A. Anchor each disconnect switch assembly to steel-channel sills arranged and sized according to manufacturer’s written instructions. Attach by bolting.

B. Fuses: Install fuses in each fusible switch.

3.3 CONNECTIONS

A. Drawings indicate general arrangement of conduit, fittings, and specialties.

B. Tighten electrical 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 and UL 486B.

END OF SECTION 262816

SECTION 265100 - LIGHTING FIXTURES

PART 1 - GENERAL (Reference Section 260500)

1.1 GENERAL

A. Provide lighting fixtures complete with lamps and accessories required for hanging. Contractor shall insure that lamps, reflector lens and trim are clean at time of final inspection. Mount recessed fixtures with trim flush to ceilings, free of gaps or cracks.

B. Coordinate mounting of ceiling mounted lighting fixtures with General Contractor. Where additional fixture supports are required due to lighting fixture location or weight, supports shall be provided by electrical contractor, unless otherwise specified under ceiling specifications.

C. Consult architectural plans for ceiling types and provide surface and recessed lighting fixtures with appropriate mounting components and accessories.

D. Lighting fixtures submitted must meet or exceed specified lighting fixture in performance and construction and appearance.

E. Provide lighting fixtures at each location shown on drawings. Lighting fixtures shall be in accordance with type designation on drawings.

F. Lighting fixture supports shall comply with the latest edition of the NEC Sections 410-15 and 410-16. Provide lighting fixture securing clips as required. In addition to clips, provide each fixture with (2) #12 slack wires, one from each corner, up to structure.

G. See lighting fixture schedule on plans for fixture types.

H. Troffers shall have a minimum depth of 4-3/8". Latches shall be spring loaded. No bent metal compression or manual latches are acceptable.

I. All interior fluorescent fixtures that have double-ended lamps and serviceable ballasts shall have integral disconnecting means per 2008 NEC 410.130(G).

1.2 INSPECTION

A. Prior to installation of luminaires Electrical Contractor shall inspect luminaire and verify unit meets or exceeds specifications, is new and unused without damage or defect and is suitable for the intended service.

B. See architectural and electrical plans for luminaire locations, coordinate installation with other trades.

C. At the completion of the project all luminaires shall be aligned, level and cleaned to the satisfaction of the A/E.

1.3 MANUFACTURERS

A. **Provide luminaires as scheduled. Any potential substitutions shall be submitted to engineer for pre-approval at least 10 days prior to bid date. The following shall be considered equivalent:**

Metalux, Lithonia, Williams Columbia, Cooper, Portfolio

Sure-Lites, Dualite

END OF SECTION 265100

SECTION 269000 - ARCHITECTURAL VERIFICATION

PART 1 – GENERAL

Reference Section 260500

1.1 RELATED DOCUMENTS

A. Contractor shall consult all Architectural Drawings and specifications in their entirety incorporating and certifying all millwork, furniture, and equipment rough-in including utility millwork. Furniture, and equipment rough-in including utility characteristics such as voltage, phase, amperage, pipe sizes, duct sizes, including height, location and orientation. Shop drawings incorporating these requirements should be submitted to the Architect for approval prior to installation or rough-in.

END OF SECTION 269000

END OF DIVISION 26

SECTION 271000 – TELECOMMUNICATIONS AND DATA

1. General Information

1.1. Manufacturer and model numbers are given through these specifications with the intention of establishing a standard of quality and operation. It is not the intention of this specification to discriminate against any "approved equal" product of another manufacturer, but is intended that a definite standard be established.

1.2. All new, renovated and remodeled buildings on the campus of Pittsburg State University will have telecommunications wiring and distribution systems that adhere to the latest TIA/EIA Standards.

1.2.1. TIA/EIA 568 Commercial Building Telecommunications Cabling Standard

1.2.2. TIA/EIA 569 Commercial Building Standard for Telecommunications Pathways and Spaces

1.2.3. TIA/EIA 607 Commercial Building Grounding and Bonding Requirements for Telecommunications

1.2.4. TIA/EIA 606 Administration Standard for the Telecommunications Infrastructure

1.3. The General Requirements Section is a summation of these Commercial Buildings Standards that mention key points of the standards. It is not intended to be a complete listing of all applicable sections. The Communications Contractor should refer to the actual published standards document. The Specific Requirements Section lists requirements that are specific to Pittsburg State University.

2. Information Systems is located on the Northwest corner of the Pittsburg State University campus, 157 Kelce, Pittsburg State University, Pittsburg, KS 66762-7519. Phone: (620) 235-4603 FAX (620) 235-4377. URL: www.pittstate.edu/office/information-services/

2.1. Contacts:

Kevin VanLanduit, OIS, Network Service Technician III	Ph 620-235-4171 Fax 620-235-4377
Rick Clutter, OIS, Network Service Technician III	Ph 620-235-4199 Fax 620-235-4377

3. Scope of Work

- The contractor will perform all work with regular employees of an organization which has regularly been engaged in the installation and servicing such installations for not less than three years; that can demonstrate the capability to adequately install and service this system within the requirements of the contract documents.
- The installation shall be in accordance with the latest requirements of the National Electrical Code, State and local codes, ordinances and regulations of any other governing body having jurisdiction. BICSI Telecommunications Distribution Methods Manual shall be used as a guideline for this installation.
- All equipment and materials furnished under this contract shall be new; including wiring and cabling, and shall be warranted by the contractor for a period of 1 year from date of final acceptance of the system against electrical or mechanical defects (except when such defects are caused by misuse.)

- Complete sets of "as built" drawings of the system shall be supplied by the installing contractor. Two sets delivered to the Office of Information Services at Pittsburg State University. These drawings shall include all jack & conduit locations, pull boxes, identification marking, cable records, etc.

4. General Requirements

- The contractor shall provide all cabling, wire hangers, communications outlets, and any other accouterment necessary in accordance with the drawings, wiring schedule and schematic diagrams.
- The premise distribution system shall adhere to the ANSI/EIA/TIA-568A, ANSI/EIA/TIA-569A Commercial Building Telecommunications Cabling Standard, BICI Telecommunications Distribution Methods Manual, IEEE Std 802.3u 100BaseTX and the National Electric Code (NEC) compliant.
- The system must be based on structured, open distribution architecture so that proposed equipment and facilities, as well as future equipment from other vendors, can be supported by the system.
- All basic jacks, patch panels, cable, etc. shall be listed by Underwriters Laboratories Inc. and shall be products of a manufacturer of established reputation and experience. The manufacturer shall have supplied similar apparatus to comparable installations rendering satisfactory service.
- All cables shall be neatly secured into place and neatly racked using approved support hardware. All cables shall be labeled as described below at both station outlet and equipment rack ends.

4.1. Horizontal Cabling System

4.1.1. Open cable trays will be provided in each main hallway. The tray shall be 4” deep x 12”wide. An appropriate number of 4” conduits, may be used in lieu of the tray when passing through firewalls. A minimum of 12 inch clearance shall be maintained on all sides of the cable tray. Cable trays are to be continuous with no offsets in the horizontal or vertical direction. Any cable placed in the horizontal distribution system will be for voice, data or campus A/V only.

4.1.2. If building design prohibits a cable tray in each main hallway provide appropriate support hardware spaced no more than 1.5 meters apart along both sides of each main hallway. Conduit will be required in areas above ceilings that do not have remove and replace lift-up ceiling tiles. Conduit or other suitable means will be required to conceal all wire and cable from being visually exposed where ceilings, moldings or cable trays do not exist.

4.1.3. Conduit from each communication outlet shall extend back to the hallway and terminate just above and within 12” of the cable tray in the hallway. In areas with removable ceiling tiles an alternative would be to stub the conduit to a point just above the ceiling grid. However if this method is used 2” sleeves must be installed in each interior wall leading back to the cable tray to allow for wiring access. Ceiling support wires are not an acceptable point of support of the horizontal distribution wiring.

4.4.4. Any sleeves or conduits used in the horizontal cabling system must have plastic bushings installed on each end.

4.2. Station Wiring and Termination

4.2.1. All voice, video, and data station wiring will be plenum rated Category 6 UTP. Voice station cable will have a white sheath, video station cable will have a gray /black sheath, and data station cable will have a blue sheath.

4.2.2. Unless otherwise specified all wires in all cables are to be terminated on associated jacks. Voice cables will be terminated on the top jack (red icon); data cables will be terminated on the bottom jack (blue icon).

4.2.3. Each outlet will be wired to support one voice and one data connection, except in locations where only wall telephones are required. All voice and data jacks shall be rated Category 6 and conform to the T568B wiring standard. Additional outlets may be required at vending machines and door entrances.

4.3. Workstation (Multimedia) Outlets

4.3.1. Recessed outlet boxes will be used for combined data, voice, and video services. Outlet boxes will be 4" x 4" x 2 1/8" deep with double gang plaster ring. Each outlet must have two 3/4" conduits with plastic bushings and no more than two 90 degree bends between the outlet and the cable tray. Pull boxes must be provided if more than two 90 degree bends are required. The use of LB, LL and LR fittings will not be approved.

4.4. Emergency & Pay Telephones

4.4.1. Outlets for emergency telephones will be recessed into the wall with specifications provided by PSU. Pay telephone locations will be verified with PSU. All outlets in public areas will conform to ADA height requirements.

4.7.2 Elevator emergency and building hallway emergency telephones will be panel mounted. PSU will determine manufacturer and provide model number for the emergency telephones. This model will meet all current applicable ADA requirements. A 3/4" conduit will be installed from the elevator equipment room to the nearest telecommunications closet. Contractor will provide wiring to elevator box connect point. Elevator Company will make final connection to Elevator. PSU Telecommunications will provide a ring down type circuit for emergency telephones to the PSU Police Department. Installation will not be deemed complete until each phone is tested in the presence of the installation contractor.

4.5. Installation

4.5.1. All work shall be provided by a licensed contractor with a minimum of five (5) years experience in telecommunications wiring and three (3) projects of comparable size as the job bid. All final connections (punch downs) shall be made by a telecommunications technician with a minimum of three (3) years experience in this field. Provide copies of all certifications.

4.6. Scheduling

4.6.1. The general contractor will complete the construction of the station outlets in order to allow the installation of communications wiring before the completion of suspended ceilings in areas where above ceiling pull boxes and cable trays are installed.

4.7. Inspection

4.7.1. The designated Engineer shall be responsible for the monitoring and quality control of the communications contractor. This will include monitoring workmanship, materials, installation practices and the adherence to all design specifications. Both announced and unannounced inspections during the construction process shall be made.

4.8. Cable Identification

4.8.1. All cable and termination labeling shall be in accordance with EIA/TIA 606 Standards. All labels shall be permanent, non-erasable, stick-on labeling printed using a professional labeling machine.

4.8.2. All Voice/Data outlets will be labeled North, East, South, West, and in a sequential numbering order clockwise 1-2-3-4 around the room. Voice outlets will begin with the letter "V" and data outlets will begin with the letter "D" followed by the room #.

4.8.3. Example: (Data in room 126), (1st outlet on East wall.) = *D-126-E1* These jack numbers will also be labeled on the corresponding patch panel or 110 block in the telecommunications closet.

4.9. Mark and stencil all cables. Place cable tags on the new cable plant, which designate the cable number and count.

4.10. Provide two copies of scaled drawings for the installed cable plant meeting all specifications outlined in the Technical Specification Document. Provide the same information on a CD in AutoCAD format. AUTOCAD documentation must be compatible with the latest version in use by PSU. For clarification, this means we will receive the drawings of the cable plant on white paper, and CD.

4.11. Remove, on a daily basis, all debris in associated work areas left as a result of Telecommunications installation.

4.12. All installations must meet or exceed existing industry standards for copper and broadband feeder cable requirements and technical specifications.

4.13. The Telecommunications Contractor awarded this project shall coordinate all installation dates and times with the Office of Information Services. It is imperative that the contractor's work will be completed in time for user occupancy. In the event that installation dates or times need to be modified, the Telecommunications Contractor will be notified by the Office of Information Systems Project Manager at least 24 hours in advance.

5. Specific Requirements

5.1. Installation Requirements

5.2. Where the installation or removal of specific materials requires access by the Telecommunications Contractor to currently operational work spaces or areas, the contractor may be required to perform some or all parts of this project before or after normal University business hours. The University's normal hours of operation may vary according to location and occupancy; however, general business hours are 8:00 a.m. to 4:30 p.m. Monday through Friday. This fact should be accounted for by the Telecommunications Contractor prior to bid submittal.

5.3. Where installations include manufactured products, the Telecommunications Contractor shall comply with manufacturer's applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than requirements indicated in this document.

5.4. The Telecommunications Contractor shall inspect each item of material or equipment immediately prior to installation, and reject damaged and defective items. These materials must conform to University specifications.

5.5. The Telecommunications Contractor shall provide connection devices and methods for securing work properly as it is installed; true to line and level, and within recognized industry tolerances if not otherwise indicated. Allowance for expansion, contraction, and building movements must also be made. The Telecommunications Contractor must provide uniform joint attachment width and spacing in exposed areas of work for the best possible visual and operational effect. Refer questionable visual effect choices to the Office of Information Systems for final decision.

5.6. The Telecommunications Contractor shall use their best judgment when working during conditions of adverse environmental conditions of temperature, humidity, exposure, forecasted weather, and status of project completion which will ensure the best possible results for each unit of work.

5.7. The Telecommunications Contractor shall coordinate enclosure (closing-up) of work with required inspections and tests to avoid necessity of uncovering or reopening work for inspection purposes. The Telecommunications Contractor shall arrange for inspection of the work by the Engineer and shall give the Engineer all necessary assistance.

5.8. Except as otherwise indicated for required approval, labels, and operating data, the Telecommunications Contractor shall not permanently attach or imprint markings on exposed surfaces of products which will be exposed to view either in occupied spaces or on exterior work.

5.9. Locate required labels and stamps on a concealed surface, or, where absolutely required for observation on an accessible surface which, in occupied spaces, is not conspicuous.

5.10. The Telecommunications Contractor shall furnish and install all necessary cable, wire, jacks, terminals, and miscellaneous hardware as required.

5.11. The Telecommunications Contractor shall comply in every way with the laws, ordinances, and rules of the State of Kansas, The National Board of Fire Underwriters, the National Electrical Code, National Electric Safety Code, and all local rules and regulations. All components of each system as a whole shall meet or exceed the minimal current standards issued by the EIA/TIA.

5.12. The contractor shall use; Siemon RJ-45 Couplers and Siemon face plates. These face plates connect directly to the plaster ring of the telephone conduit boxes, single and double-gang electrical junction wall boxes (metal or plastic), and Siemon series surface housings. Because the face plates connect directly to these devices, there is no allowance for adjustment for correcting to true alignment and level. Therefore, it is mandatory that the contractor installs the conduit boxes, junction wall boxes, and Siemon series surface housings to true alignment and level.

5.13. The contractor is responsible for making sure his workers and subcontractors follow University Parking regulations. The vendor and his subcontractors are responsible for acquiring the necessary parking permits while performing work on campus. Each individual is responsible for any parking violation citations received while on campus property.

5.14. Disposal of abandoned cable is the responsibility of the vendor.

6. Drawings and Test Records

6.1. The University has records and drawings on paper of their Telecommunications Premise Distribution Systems. As modifications or changes are made to the system, it is necessary to update the University drawings and records. Therefore, drawings and records must be provided on this project. The successful contractor will be given paper prints and they are required to prepare and provide scaled drawings illustrating the new distribution system(s) and to provide test results via actual records. The vendor must deliver all drawings and test records to the Office of Information Systems.

6.2. It is the Telecommunication Contractors responsibility to insure that all building, outside plant, station, and all other records and drawings that would relate to this project are updated. This will include additions that are performed by other parties such as the general contractor or his subcontractors. Questions from the telecommunication contractor regarding this issue should be addressed to the Office of Information Systems prior to bid submittal.

6.3. Furnish operating instructions, service and maintenance instructions, one- line diagrams, data sheets for the exact equipment installed, manufacturer’s parts lists and parts numbers or other identification established by the original manufacturer, schematic diagrams of the frames, and other diagrams included as part of the manufacturer’s data sheets. "As built and installed" drawings shall be included in the service manuals and shall show all cable and terminal markings corresponding with the equipment. One preliminary copy of the information shall be delivered to the Office of Information Systems for approval prior to completion of the manuals. If additions or revisions are required, the contractor shall make them and re-submit a preliminary manual. After approval deliver two copies to the Office of Information Systems.

6.4. Telecommunications Contractor will prepare and submit records and drawings "TO SCALE". Telecommunications Contractor must provide 4 (four) copies on white paper with black print, approximate size 24" x 36". Provide a copy in AutoCAD release 13 on 3.5" diskette.

7. Appendix A

Cable Specifications

Fiber Optic Cable Technical Specifications:
It is the intention of the Office of Information Systems to use hybrid indoor/outdoor plenum rated cable in all future feeder distribution applications.

Fiber type:	Multimode
Cable Core:	Tight buffer construction
Sheath:	Plenum rated
Numeric aperture:	0.275 +/- .015 micrometers
Core diameter:....	62.5..micrometers
Cladding diameter:	125 +/- 2.0 micrometers
Core to cladding concentricity:	</= 3.0 micrometers
Non-circularity cladding:	< 2%
Non-circularity core:	< 1%
Minimum bandwidth:	200MHz/km at 850 nanometers
500MHz/km at 1300 nanometers	
Chromatic Dispersion:	
minimum zero dispersion wavelength -	1332 nanometers
maximum zero dispersion wavelength -	1354 nanometers
maximum zero dispersion slope -	0.097 ps/(nm2 . km)
Maximum attenuation:	3.00 db per kilometer at 850 nanometers
Maximum attenuation:	1.00 db per kilometer at 1300 nanometers
Minimum proof test (un-cabled:	100,000 lbs per sq. in
Temperature range:	-20 to + 65 degrees Celsius
Cable tensile load:	600 lbs.

All individual fibers must meet maximum attenuation loss over entire temperature range.
All individual fibers must meet minimum bandwidth dispersion.

Fiber type:	Single-mode
Cable Core:	Tight buffer construction
Sheath:	Indoor/Outdoor Plenum rated
Core diameter:	8.3 micrometers (nominal)
Cladding diameter:	125 +/- 1.0. micrometers
Coating diameter:	900.micrometers
Mode field diameter:	8.8 micrometers + or - 0.5 microns
Core eccentricity:	Less than or equal to 1.0 micron
Maximum attenuation:	.35 db per kilometer at 1310 nanometers
	.35db per kilometer at 1550 nanometers
Zero dispersion wavelength:	1310 + or - 010 nm
Max. dispersion:	3.2 ps/nm -- km
Cut-off wavelength:	Max. 1250 nm -- specified by customer
Cable tensile load:	600 lbs
Cable min. bend radius:	15X cable diameter under no load.(0-180lbs)
20X cable diameter under load.(181-600lbs)	
Minimum proof test:	100,000 lbs per sq. in (uncabled):
Temperature range:	-20 to +65degrees Celsius

Feeder Distribution Copper Cable:

Gauge:	24 AWG
Pair Size:	25 to 1500
DC Resistance:	27.3 ohms/1000 ft.
Mutual Capacitance:	15.7 nf/1000 ft. (above 1.0 MHz)
Impedance:	100 ohms (above 1.0 MHz)
Attenuation:	5.49 at 772 kHz and 6.25 at 1.0 MHz
Sheath:	Polyethylene
Shield:	8 mil aluminum or equivalent
Color Code:	Standard PIC 25/50 pr binders

Miscellaneous Equipment

Wall Plate: Siemon CT4-FP-** (duplex) CT8-FP-** (quad) ** denotes color
Wall Jack: Siemon CT-C6** ** denotes color
Blanks Inserts: Vendor #CT-BLNK-** **denotes color

CAT6 Cable (Plenum Rated):
Berk-Tek CMP-00423BKTE-6U-01(White Jacket)
Berk-Tek CMP-00423BKTE-6U-06 (Blue Jacket)

SECTION 283111 - FIRE ALARM SYSTEM

PART 1 - GENERAL

A. SCOPE

1. The work covered by this Section consists of furnishing all labor, materials, tools, equipment, services, coordination, and supervision required to install, test, and place in service additions to the existing fire alarm system.
2. All system operations shall comply with the complete NFPA 72, (2010 Edition). In the event that discrepancies arise between contract documents, local codes and ordinances the more stringent requirement will apply.
3. All work performed and all materials furnished shall meet the requirements of the applicable current standards of the National Fire Protection Association (NFPA): 72-2010; Underwriters' Laboratories, Inc. (UL); Americans with Disabilities Act and other federal, state, and local codes and ordinances except as otherwise indicated on the drawings or specified herein.
4. After entering into the contract, the Contractor shall be held responsible for the completion of all work necessary within the time frame of the owner's completion scheduled date for a complete and approved installation without extra expense to the Owner or Engineer. The Contractor shall prepare any supplementary detailed diagrams or drawings, which may be required by the state authority or local Authority Having Jurisdiction (AHJ).
5. Any deviations from the requirements of this specification must be acknowledged in writing to the Engineer prior the supplier's bid offer.

B. APPLICABLE REFERENCES

1. National Fire Protection Association (NFPA):

   a) No. 70 - 2011, National Electric Code (NEC)
   b) No. 72 - 2010, National Fire Alarm Code
   c) No. 1221 – 2010, Standard for Installation, Maintenance & Use of Emergency Services Communications Systems

2. Underwriters Laboratories Inc. (UL):

   a) No. 50 - Cabinets and Boxes
   b) No. 268 - Smoke Detectors for Fire Protective Signaling Systems
   c) No. 864 - Control Units for Fire Protective Signaling Systems
   d) No. 268A - Smoke Detectors for Duct Applications.
   e) No. 521 - Heat Detectors for Fire Protective Signaling Systems.
   f) No. 464 - Audible Signaling Appliances.
   g) No. 38 - Manually Actuated Signaling Boxes.
   h) No. 1481 - Power supplies for Fire Protective Signaling Systems.
   i) No. 1971 – Signaling Devices for the Hearing Impaired.
   j) No. 1638 – General Signaling.

C. SUBMITTALS

1. General: Contractor shall submit the following:

   a) Submittals and shop drawings shall be approved by the Engineer prior to ordering equipment or commencing system installation.

b) Operation and Maintenance manuals and as-built drawings shall be provided in electronic format and hard copy at the completion of the project.
c) Complete and comprehensive submittals in full accordance with NFPA 72 and these specifications.
d) Five complete sets of submittals. Partial submittals shall not be accepted.

2. Approval of submittals shall not relieve Contractor of conformance with the contract specifications, the contract drawings, specifications, and applicable codes and standards. The following are required submittals:

a) Shop Drawings: The shop drawings shall, as a minimum, include the equipment layout, device arrangement, output ratings of the audible and visual devices, complete point-to-point wiring diagrams, conduit/wiring layouts, riser diagram, battery calculations, voltage drop calculations, sequence of operations and internal panel diagrams.
b) Battery and Voltage Drop Calculations: Provide complete calculations for battery capacity for alarm/supervisory modes and current drain/load consumption of all circuits while in alarm condition. Provide complete calculations for voltage drop on all notification appliance circuits and verify the system will provide the proper voltage to supply the notification appliances. The battery and voltage drop calculations shall be provided with the shop drawings and updated and submitted with the as-built drawings.
c) Product Certifications: Provide technical data sheets by the manufacturers of all fire alarm and electrical equipment proposed for installation. Certifications shall clearly indicate products comply with the referenced standards and these specifications. All fire alarm equipment shall be submitted. As a minimum, the following electrical equipment shall be submitted: wire and cables; raceway, i.e. conduit; back boxes for devices; pull/junction boxes; automatic label maker; terminal blocks used for splices; and conduit connectors. All Certifications shall be clearly indexed and marked to indicate the proposed items of equipment to be furnished. Item shall be submitted with the Shop Drawings.
d) Operation & Maintenance (O&M) Manuals: O&M Manual shall be neatly organized in 8 ½ x 11 three-ring hard cover binder in typed format with tabbed fly sheets and index. Contents shall include: Cover with Contractor and Project information; complete instructions regarding operations and maintenance of all equipment; test report/address description list; final complete fire alarm system program report reflecting final conditions (shall include all operating instructions written for fire alarm programming); copy of all guarantees and warranties issued, and; manufacturers' bulletins, cut sheets, and descriptive data, where pertinent, clearly indicating the precise items included in this installation, and deleting, or otherwise clearly indicating, all manufacturers' data with which this installation is not concerned. Preliminary Submittal to be submitted with Shop Drawings. Final Submittal to be submitted with Record/As-Built Drawings.
e) Record/As-Built Drawings: Accurate (±1’-0”) As-Built drawings reflecting the as-built conditions shall be provided to the Engineer prior to acceptance testing. As-Built drawings shall be furnished to the Engineer on electronic media in AutoCAD 2004 compatible format and also a complete set of reproducible tracings of 24” x 36” scale (minimum) showing the as built layout of all conduit systems and/or wire routing and all fire alarm equipment, complete riser diagrams showing all devices, and accurate panel diagrams showing all field wiring terminations and labels.

D. QUALITY ASSURANCE

1. All equipment furnished shall be new and the latest state-of-the-art products of a manufacturer engaged in the manufacturing and sale of fire alarm equipment for over ten years.

a) The General Contractor shall contract with a single source for supplying job materials, services, and programming, including final inspection/test services for the fire alarm system.

2. Installer Qualifications: Contractor shall complete the following:

a) Demonstrate in writing for advance approval by the Engineer, 5 years of fire alarm installation experience.
b) Provide in writing for advance consideration at least five local references for similar fire alarm system installation projects.
c) Engage an experienced factory-authorized service representative to oversee the work of this Section and the testing of the system. The factory-authorized service representative shall be available during the entire construction phase, including testing. The Contractor shall provide a copy of the factory certificate of the factory-authorized service representative for this project.
d) The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final check-out and to ensure the systems integrity.

3. All materials and equipment furnished and installed under this Section shall be new and currently listed by UL, Inc., or approved by FM Engineering Corporation for use in fire protection equipment except as otherwise specified herein.

E. MAINTENANCE AND WARRANTY SERVICE

1. All work performed, all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) years from the date of formal acceptance. The full cost of all service/diagnostics, maintenance, labor and materials, reprogramming, retesting, pickup and delivery required to correct any defect during the two year period shall be included in the bid submittal. Replacement parts shall be the original manufacturer's replacement parts, components, and supplies. Any required testing and maintenance cost for this maintenance and testing of the system shall be at no extra cost to the Owner and shall be included as part of this contract.
2. The Warranty shall also include all service, maintenance and testing as required by NFPA 72, Chapter 14 for the year one period after the date of formal system acceptance.
3. Warranty service shall be performed within 24 hours of notification during normal working hours (Monday through Friday, 8:00 a.m. to 5:00 p.m., excluding holidays) and within 48 hours of notification during all other times.

PART 2 - PRODUCTS

A. All equipment and products furnished shall be UL listed or FM approved and labeled, and connection shall comply with NEMA construction standards.

B. DEVICES

1. Manual Pull Stations: Double-action type, fabricated of metal and finished in red with molded, raised-letter operating instructions of contrasting color. Stations requiring the breaking of a glass panel are not acceptable. Stations requiring the breaking of a concealed glass rod shall not be provided.

a) Station Reset: Key- or wrench-operated, double-pole, double-throw, switch rated for the voltage and current at which it operates. Stations shall have screw terminals for connections.
b) All manual pull stations shall be provided with a clear protective cover that will produce a local alarm when opened and shall be battery powered.

2. Smoke/Heat Detectors: Detectors shall be photoelectric type combination smoke/heat. The smoke detectors shall comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems" and shall include the following features:

a) Factory Nameplate: Serial number and type identification.
b) Combination smoke/heat detectors.
c) Operating Voltage: 24 VDC, nominal.
d) Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
e) Visual Indicator: Each sensor base shall contain an LED that will flash as an indication of proper sensor operation. Sensors that do not provide a visible indication of an abnormal condition at the sensor location shall not be acceptable.

3. Duct Detectors: For duct mounted applications provide detector housing with auxiliary relay and sampling tubes as required.

a) For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.
b) To minimize false alarms, voltage and RF suppression techniques shall be employed as-well-as a smoke signal verification circuit and an insect screen.
c) Auxiliary relays and/or remote LED alarm indicators and key operated test stations shall be installed for each duct detector.

C. FIRE ALARM AUDIBLE/VISUALS AND VISUALS AND AUDIBLES ONLY

1. General: Visual and audio/visual indicating appliances shall be Potter Select- A-Strobe Model SL-1224. These devices shall have a minimum of 6 candela settings. The candela settings shall be selectable using a drum roller and shall display the candela settings on the front of the device. The visual appliance shall have a 1 HZ flash rate. The light unit shall be of ABS polycarbonate and the lens of high grade, optical quality LEXAN.
2. All visual appliances shall be in compliance with ADA and as indicated on the drawings providing synchronization as required.
3. Audible appliances shall provide a minimum 90 dBA sound level at 10 feet with a 1kHz signal.

D. NOTIFIICATION POWER SUPPLY

1. Power supply shall be a Potter Model PSN-106, 10 Amp 24VDC switch mode power supply with 6 independent configurable outputs.
2. Additionally 4 spare circuits shall be provided for future remodel.

E. FIRE ALARM ELECTRICAL IDENTIFICATION

1. All electrical identification shall comply with the requirements found in the NFPA 70 2011 Edition.

F. WIRE

1. All wire shall comply with the requirements found in the NFPA 70 2011 Edition. All wiring shall be installed in a minimum of ¾ inch metallic conduit in all areas with exposed structure and concealed spaces created by hard ceiling or other type of permanent ceiling or wall covering.
2. All wiring shall be THHN or TFFN stranded with crimp on terminal ends affixed.
3. Wire shall be in strict accordance with manufacturer's published installation recommendations, Article 760 of NFPA 70 (2011 Edition), the drawings, and these specifications.
4. Splicing of wire shall not be permitted. All wiring is to be continuous from panel to device and device. Terminal blocks shall be used only where absolutely necessary.
5. The use of wire nuts is prohibited.
6. All wiring shall be color-coded and fully identified. Provide the proposed color code with the submittal documentation.
7. The use of plenum rated cable shall be permitted in areas with lay-in ceiling tile. Support all cable to the building structure with J-hooks and Bridal Rings.

PART 3 - EXECUTION

A. GENERAL REQUIREMENTS

1. System installation shall be in full accordance with the requirements found in the, drawings, specifications, NFPA Standards, and the manufacturer's published recommendations.

B. WIRING INSTALLATION

1. All wire shall be installed in accordance with the requirements found in the NFPA 70 2011 Edition..
2. All detection and alarm wire shall be installed in separate conduits where required. Each circuit outgoing and return conductors exiting and returning to the control unit respectively are to be routed separately as required by NFPA 72. Conduit shall be EMT. Exception would be those locations deemed unsuitable for EMT conduit. In such cases, use Rigid or PVC type conduit. Minimum conduit size shall be ¾". Alarm and supervisory wiring shall be in separate conduits. All conduletes and junction boxes shall be identified through color coding and labeling.
3. All fire detection and alarm system wiring required to be installed in conduit shall minimum ¾" EMT conduit complete and shall be clearly identified.
4. Minimum fire alarm circuit size shall be as follows:

    a) Initiating device circuits shall be a minimum of AWG No. 18.
    b) Notifications Appliance Circuits shall be AWG No. 14 or larger.
    c) Line voltage circuits shall be AWG No. 12 or larger.

5. Wiring Method:

    a) All wiring raceways shall be in accordance with NFPA 72 and Article 760 of NFPA 70. Physical raceways for fire alarm circuits shall be a minimum of ¾ inch.
    b) System drain wires and conduit grounding shall be properly installed in accordance with the manufacturer's published recommendations.
    c) Wiring splices shall be held to an absolute minimum and avoided to the extent possible. If needed, they shall be made only in junction or outlet boxes and shall be connected on terminal blocks with crimp-type connectors.

6. Wiring Within Enclosures:

    a) Install conductors parallel with, or at right angles to, the sides and back of the enclosure. Bundle, lace, and train the conductors to terminal points with no excess. Panels shall be completely dressed.
    b) Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal in accordance with the wiring diagrams of the system.
    c) Separate all wiring for initiating devices from all other wiring in FCP enclosure.

7. Grounding shall be provided and connected in strict accordance with manufacturer's installation recommendations.

    a) FACP shall be grounded in accordance with NFPA 70. Raceway ground shall not be acceptable.
    b) Raceways shall be earth grounded throughout the system.
    c) Ground conduits, panels, and devices with green wire.

8. Before any of the devices are connected, each circuit/conductor shall be megger tested except the circuits/conductors intentionally and permanently grounded. Test for resistance to ground. Report readings less than 1 megaohm for evaluation. The megger testing shall be documented and available for review by the Engineer (See Section III.F.3, herein).

9. Protection, Cleaning, and Adjustment

    a) Protection from damage and contamination shall be provided for all system components, devices, and equipment during the entire installation and until acceptance testing.
    b) Damaged or contaminated devices and/or components shall be replaced before final testing.
    c) Final system adjustment, including detector sensitivity, shall be provided before final acceptance testing.

C. Fire Alarm Circuit and Equipment Identification:

1. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations used in electrical identification work with corresponding designations specified or indicated on the approved drawings and address list as applicable.
2. All Primary Power Circuit Breakers shall be provided with Laminate Signs indicating breaker designation as fire alarm and shall include reference to which fire alarm equipment served.
3. Equipment Identification: Securely fasten Laminate Signs to all fire alarm control panels, remote power supplies, etc. Signs shall indicate general equipment name, device label and location of fire alarm primary power breaker.
4. Circuit Identification: Securely fasten Circuit Identification Labels to circuits at all initiating devices, notification appliances, terminal connections and all other splices. Identification markings must correspond with the approved shop drawing circuit designations. Labels must be applied to be legible without moving equipment, labels, circuits, etc.
5. Install identification products in accordance with the manufacturer's written instructions and requirements of NFPA 70.

D. FIELD QUALITY CONTROL

1. Manufacturer's Field Services: Provide services of a pre-approved, factory-authorized service representative to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system. Contractor shall provide written substantiation of the manufacturer's representative's authorization and credentials in advance.
2. Pre-testing: Upon completing installation of the system, align, adjust, and balance the system and perform complete pre-testing. Determine, through pre-testing, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pre-testing. Replace malfunctioning or damaged items with new equipment, and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of the acceptance test results.
3. Wiring runs shall be tested for continuity, short circuits and grounds before system is energized. Resistance, current and voltage readings shall be made as work progresses. All circuits shall be tested for shorts and/or leakage with a “megger” (meg-ohm meter). Provide all testing information in a documented report with all values of the testing of each installed piece of wiring and the signature of the testing personnel.
4. Report of Pretesting: After pretesting is complete, provide a letter and all test reports to the Engineer to certify that the installation is complete and fully operable. Include the names and titles of the witnesses to the preliminary tests.
5. Final Test Notice: Provide a 30-day minimum notice in writing when the system is ready for final acceptance testing.

E. TESTING

1. All test equipment, instruments, tools and labor required to conduct the system tests shall be provided by the Contractor. As a minimum for conducting the tests, ladders; multimeter; two-way radios; flashlights; smoke generation devices and supplies, and; decibel meter shall be available.

2. All initiating devices shall be tested and logged for correct operation. Smoke/heat detectors shall be tested for sensitivity using test equipment specifically designed for that purpose. Sensitivity shall be documented on the test report.
3. Presence of a manufacturer's authorized technical representative shall be required at all acceptance tests and retests.
4. Acceptance testing shall be in accordance with the procedures outlined in NFPA 72, the manufacturer's recommendations, and the direction of the Engineer and AHJ. In addition, the “Fire Alarm System Checklist for Acceptance” document will be used as part of the acceptance test. This document is provided at the end of this section for reference purposes.
5. System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:

    a) Open, shorted and grounded addressable signaling circuit.
    b) Open, shorted and grounded circuits.
    c) Open, shorted and grounded horn circuits.
    d) Addressable device removal.
    e) Primary power or battery disconnected.
    f) Incorrect device at address.

6. System evacuation alarm indicating appliances shall be demonstrated as follows:

    a) All alarm notification appliances operate as programmed.

b) The ambient sound level of each room shall be recorded and the sound level of the audible devices in each room shall be recorded to verify the performance of the system.

7. System indications shall be demonstrated as follows:

a) Correct message display for each alarm input at the control panel, network workstations and remote alpha-numeric display.

8. Secondary power capabilities shall be demonstrated as follows:

a) System primary power shall be disconnected for a period of **72 hours**. At the end of that period, an alarm condition shall be created and the system shall perform as specified for 5 minutes.
b) System primary power shall be restored for 24 hours and system charging current shall be normal trickle charge for a fully charged battery bank.
c) System battery voltages and charging currents shall be checked at the fire alarm control panel using the codes and display on the LCD.

F. FORMAL ACCEPTANCE TESTING

1. Formal acceptance testing shall be held in the presence of the Engineer, the and Owner, and to their satisfaction. The Contractor shall supply personnel and required auxiliary equipment for this test without additional cost to the Owner.
2. Report of Pretesting and Acceptance test: After pretesting is complete, provide a letter and all test reports to the Engineer to certify that the installation is complete and fully operable. Include the following:

a) Names and titles of the witnesses to the preliminary tests.
b) Written certification confirming the full compliance with these specifications, the manufacturer’s latest recommendations and NFPA 72 (2010 Edition).
c) Written certification confirming the system is free of ground faults, short circuits, and the absence of unwanted voltages between circuit conductors and ground in accordance with the manufacturer's recommendations and NFPA 72 and adequately megger tested including meggar test documentation.
d) Written certification and test results of the complete system checkout procedure in accordance with the manufacturer's published installation recommendations and NFPA 72.

3. The Engineer shall be provided with two preliminary copies of the record drawings for use during the testing procedure to verify operation as programmed.
4. In the event of system failure to perform as specified and programmed during the testing procedure, at the discretion of the Owner, or Engineer, the test shall be terminated and rescheduled after the Contractor has made corrections and repeated the pre-testing procedure.
5. The Owner or Engineer may elect to require the complete test procedure be performed again if, in their opinion, modifications to the system hardware or software warrant complete retesting.
6. Operational Test: Acceptance of the system shall also require a demonstration of the stability of the system. This shall be adequately demonstrated if the system operates for a 90 day test period without any unwarranted alarms. Should an unwarranted alarm(s) occur, the Contractor shall readjust or replace the detector(s) or necessary equipment and begin another 90 day test period.

G. WRITTEN CERTIFICATIONS AND/OR TEST REPORTS

1. The following four written certifications and/or test reports shall be submitted by the installation Contractor before final and formal acceptance will be scheduled:

a) Written certification and test results confirming full compliance with these specifications, the manufacturer's latest recommendations, and NFPA 72 (2007 Edition).
b) Written certification and test results confirming the system is free of ground faults, short circuits, and the absence of unwanted voltages between circuit conductors and ground in accordance with the manufacturer's recommendations and NFPA 72 and adequately megger tested.
c) Written report on final system programming configuration.
d) Written certification and test results of the complete system checkout procedure in accordance with the manufacturer's published installation recommendations and NFPA 72 including:

(1) A complete list of equipment installation and wiring.
(2) Indication that all equipment is properly installed and functioning, and conforms with these Specifications.
(3) Technician's name, certification number, and data.
(4) After completion of all the tests and adjustments listed above, the Contractor shall submit the following information to the Engineer.
(a) Record Drawings
(b) Detailed catalog data on all installed system components.
(c) Copy of the test report.
(d) UL Certificates and/or listing documentation to verify that all equipment is UL Listed for its intended use.
(5) Final test and inspection shall be held in the presence of the Engineer and to their satisfaction. The Contractor shall supply personnel and required auxiliary equipment for this test without additional cost.
(6) Acceptance of the system shall also require a demonstration of the stability of the system. This shall be adequately demonstrated if the system operates for a 90 day test period without any unwarranted alarms. Should an unwarranted alarm(s) occur, the Contractor shall readjust or replace the detector(s) and begin another 90 day test period. As required by the Engineer, the Contractor shall recheck the devices using the fire test after each readjustment or replacement of devices.
(7) If the requirements provided in the paragraph above are not completed within one year after beginning the tests described therein, the Contractor shall replace the system with another acceptable manufacturer and the process repeated until acceptance of the equipment by the Engineer without additional costs.
(8) Before final acceptance of the work and the release of the retainage, the Contractor shall deliver three copies of the complete Operating and Maintenance Manual and Record Drawings to the Engineer in hard copy (5 complete sets) and electronic copy in AutoCAD, Version 2004 or greater.

H. CLEANING AND ADJUSTING

1. Cleaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean units internally using methods and materials recommended by manufacturer.
2. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three visits at eight hours a piece to the site for this purpose.

I. DEMONSTRATION

1. Provide the services of a factory-authorized service representative to demonstrate the system and train personnel as specified below upon completion of the field installation.
2. Train personnel in the procedures and schedules involved in operation, troubleshooting, service, and preventive maintenance of the system. Provide a minimum of four hours of on-site training.
3. Schedule the on-site training with the Owner at least seven days in advance of the training.

END OF SECTION 283111