

CONSTRUCTION SPECIFICATIONS



surviv(AL) house

UAB THE UNIVERSITY OF
ALABAMA AT BIRMINGHAM



SECTION 00 0110

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END OF SECTION

SECTION 01 1000**SUMMARY****PART 1 GENERAL****1.01 PROJECT**

- A. Project Name: surviv(AL), UAB Solar Decathlon House
- B. Owner's Name: The University of Alabama at Birmingham.
- C. The Project consists of the construction of a new 998 SF single-family home in a transportable module for highway transit for reassembly on the DOE Solar Decathlon competition site and then for disassembly and reassembly in Birmingham. The work includes structure, interior and exterior finishes, fixtures, and appliances, electrical, mechanical, plumbing, and fire protection systems. Some special mechanical systems included are a Heat Pump Water Heater and a Dehumidification system. The work also includes deck, ramps, planters, a canopy, and a solar array that will also be transportable to the site.
- D. The team plans to establish a goal for diverting 80% of the construction waste from the construction from the waste stream for recycling or reuse.
- E. Construction of the house is temporary foundations on grade, wood framed structure, fiber cement siding and trim with standing-seam metal roofing over the main building and translucent polycarbonate panel roofing over the Porch.
- F. Site improvements include interconnection to the competition utility, wood framed porches, ramps, cover for water tanks, landscaping in planters, site lighting, and signage.

1.02 WORK SEQUENCE

- A. Contractor is responsible for sequencing the Work so as to ensure completion within the approved schedule without unnecessary delays.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION - NOT USED****END OF SECTION**

SECTION 01 3000**ADMINISTRATIVE REQUIREMENTS AND PROCEDURES****PART 1 GENERAL****1.01 SECTION INCLUDES****PART 2 PRODUCTS - NOT USED****PART 3 EXECUTION****3.01 PROGRESS MEETINGS**

- A. General Contractor shall schedule and administer meetings throughout progress of the Work at minimum twice monthly intervals, or more frequently as designated by Owner or Tenant.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Alabama Pain Physicians, and Architect's Representatives, as appropriate to agenda topics for each meeting.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Alabama Pain Physicians, participants, and those affected by decisions made.

3.02 CONSTRUCTION PROGRESS SCHEDULE

- A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 5 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
 - 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.

3.03 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 - 1. Product data.
 - 2. Shop drawings.
 - 3. Samples for selection.
 - 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the Design Concept expressed in the contract documents.
- C. Samples will be reviewed only for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.04 SUBMITTALS FOR INFORMATION

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

3.05 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout:
 - 1. Project record documents.
 - 2. Operation and maintenance data.
 - 3. Warranties.
 - 4. Bonds.
 - 5. Other types as indicated.
- D. Submit for Alabama Pain Physicians's benefit during and after project completion.

3.06 NUMBER OF COPIES OF SUBMITTALS

- A. Documents for Review:
 - 1. Small Size Sheets, Not Larger Than 8-1/2 x 11 inches: Submit the number of copies that Contractor requires, plus 3 copies one of which will be retained by Architect, with the other 2 provided to the Owner and Tenant.
 - 2. Larger Sheets, Not Larger Than 24 x 36 inches: Submit one reproducible transparency and 2 opaque reproductions.
- B. Documents for Information: Submit 3 copies.
- C. Samples: Submit the number specified in individual specification sections, but not fewer than 4; one of which will be retained by Architect.
 - 1. Retained samples will not be returned to Contractor unless specifically so stated.

3.07 SUBMITTAL PROCEDURES

- A. Shop Drawing Procedures:
 - 1. Prepare accurate, drawn-to-scale, original shop drawing documentation by comprehending the Design Intent of the Contract Documents and coordinating related Work.
 - a. Reproduction of the contract drawings in whole or part is not acceptable and such submittals shall be disposed of, or returned without review..
- B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- C. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- E. Deliver submittals to Architect at business address.
- F. For each submittal for review, allow 21 days excluding delivery time to and from the Contractor.
- G. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
- H. Provide space for Contractor and Architect review stamps.
- I. When revised for resubmission, identify all changes made since previous submission.
- J. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- K. Submittals not requested will not be recognized or processed.

END OF SECTION

SECTION 01 4000**QUALITY REQUIREMENTS****PART 1 GENERAL****1.01 SUBMITTALS**

- A. Testing Agency Qualifications:
 - 1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
- B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- C. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
 - 1. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
 - 1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
- E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator .
 - 1. Submit report in duplicate within 30 days of observation to Architect for information.
 - 2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- G. Erection Drawings: Submit drawings for Architect's benefit as contract administrator.
 - 1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
 - 2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect.

1.02 REFERENCES AND STANDARDS - See Section 01 4219**PART 2 PRODUCTS - NOT USED****PART 3 EXECUTION****3.01 CONTROL OF INSTALLATION**

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have Work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

3.02 MOCK-UPS

- A. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mock-ups shall be a comparison standard for the remaining Work.
- D. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not conforming to specified requirements.
- B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 4216**DEFINITIONS****PART 1 GENERAL****1.01 SUMMARY**

- A. This section supplements the definitions contained in the General Conditions.
- B. Other definitions are included in individual specification sections.

1.02 DEFINITIONS

- A. **Furnish:** To supply, deliver, unload, and inspect for damage.
- B. **Install:** To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.
- C. **Product:** Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.
- D. **Project Manual:** The book-sized volume that includes the procurement requirements (if any), the contracting requirements, and the specifications.
- E. **Provide:** To furnish and install.
- F. **Supply:** Same as Furnish.
- G. **Architect:** The Architect is the person or entity lawfully licensed to practice architecture in the State of Alabama, who is under contract with the Owner as the primary design professional for the Project and identified as the Architect in the Construction Contract. The term "Architect" means the Architect or the Architect's authorized representative. If the employment of the Architect is terminated, the Owner shall employ a new Architect whose status under the Contract Documents shall be that of the former Architect. If the primary design professional for the Project is a Professional Engineer, the term "Engineer" shall be substituted for the term "Architect" wherever it appears in this document.
- H. **Contract:** The Contract is the embodiment of the Contract Documents. The Contract represents the entire and integrated agreement between the Owner and Contractor and supersedes any prior written or oral negotiations, representations or agreements that are not incorporated into the Contract Documents. The Contract may be amended only by a Contract Change Order or a Modification to the Construction Contract. The contractual relationship which the Contract creates between the Owner and the Contractor extends to no other persons or entities. The Contract consists of the following Contract Documents, including all additions, deletions, and modifications incorporated therein before the execution of the Construction Contract:
 - 1. Construction Contract
 - 2. Performance and Payment Bonds
 - 3. Conditions of the Contract (General, Supplemental, and other Conditions)
 - 4. Specifications
 - 5. Drawings
 - 6. Contract Change Orders
- I. **Contract Sum:** The Contract Sum is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents. The term "Contract Sum" means the Contract Sum stated in the Construction Contract as may have been increased or decreased by Change Order(s) in accordance with the Contract Documents.
- J. **Contract Time:** The Contract Time is the period of time in which the Contractor must achieve Substantial Completion of the Work. The date on which the Contract Time begins is specified in the written Notice To Proceed issued to the Contractor by the Owner. The Date of Substantial Completion is the date established in accordance with the General Conditions. The term "Contract Time" means the Contract Time stated in the Construction Contract as may have been extended by Change Order(s) in accordance with the Contract Documents. The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

- K. Contractor: The Contractor is the person or persons, firm, partnership, joint venture, association, corporation, cooperative, limited liability company, or other legal entity, identified as such in the Construction Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.
- L. Defective Work: The term "Defective Work" shall apply to: (1) any product, material, system, equipment, or service, or its installation or performance, which does not conform to the requirements of the Contract Documents, (2) in-progress or completed Work the workmanship of which does not conform to the quality specified or, if not specified, to the quality produced by skilled workers performing work of a similar nature on similar projects in the state, (3) substitutions and deviations not properly submitted and approved or otherwise authorized, (4) temporary supports, structures, or construction which will not produce the results required by the Contract Documents, and (5) materials or equipment rendered unsuitable for incorporation into the Work due to improper storage or protection.
- M. Drawings: The Drawings are the portions of the Contract Documents showing graphically the design, location, layout, and dimensions of the Work, in the form of plans, elevations, sections, details, schedules, and diagrams.
- N. Notice to Proceed (NTP): A proceed order issued by the Owner or Director, as applicable, fixing the date on which the Contractor shall begin the prosecution of the Work, which is also the date on which the Contract Time shall begin.
- O. Owner: The Owner is the entity or entities identified as such in the Construction Contract and is referred to throughout the Contract Documents as if singular in number. The term "Owner" means the Owner or the Owner's authorized representative. The term "Owner" as used herein shall be synonymous with the term "Awarding Authority" as defined and used in Title 39 - Public Works, Code of Alabama, 1975, as amended.
- P. The Project: The Project is the total construction of which the Work required by these Contract Documents may be the entirety or only a part with other portions to be constructed by the Owner or separate contractors.
- Q. Project Manual : The Project Manual is the volume usually assembled for the Work which may include the Advertisement for Bids, Instructions to Bidders, sample forms, General Conditions of the Contract, Supplementary Conditions, and Specifications of the Work.
- R. Specifications: The Specifications are that portion of the Contract Documents which set forth in writing the standards of quality and performance of products, equipment, materials, systems, and services and workmanship required for acceptable performance of the Work.
- S. Subcontractor: A Subcontractor is a person or entity who is undertaking the performance of any part of the Work by virtue of a contract with the Contractor. The term "Subcontractor" means a Subcontractor or its authorized representatives.
- T. The Work: The Work is the construction and services required by the Contract Documents and includes all labor, materials, supplies, equipment, and other items and services as are necessary to produce the required construction and to fulfill the Contractor's obligations under the Contract. The Work may constitute the entire Project or only a portion of it.
- U. The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.
- V. Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION - NOT USED****END OF SECTION**

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- L. Defective Work: The term "Defective Work" shall apply to: (1) any product, material, system, equipment, or service, or its installation or performance, which does not conform to the requirements of the Contract Documents, (2) in-progress or completed Work the workmanship of which does not conform to the quality specified or, if not specified, to the quality produced by skilled workers performing work of a similar nature on similar projects in the state, (3) substitutions and deviations not properly submitted and approved or otherwise authorized, (4) temporary supports, structures, or construction which will not produce the results required by the Contract Documents, and (5) materials or equipment rendered unsuitable for incorporation into the Work due to improper storage or protection.
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- O. Owner: The Owner is the entity or entities identified as such in the Construction Contract and is referred to throughout the Contract Documents as if singular in number. The term "Owner" means the Owner or the Owner's authorized representative. The term "Owner" as used herein shall be synonymous with the term "Awarding Authority" as defined and used in Title 39 - Public Works, Code of Alabama, 1975, as amended.
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- Q. Project Manual : The Project Manual is the volume usually assembled for the Work which may include the Advertisement for Bids, Instructions to Bidders, sample forms, General Conditions of the Contract, Supplementary Conditions, and Specifications of the Work.
- R. Specifications: The Specifications are that portion of the Contract Documents which set forth in writing the standards of quality and performance of products, equipment, materials, systems, and services and workmanship required for acceptable performance of the Work.
- S. Subcontractor: A Subcontractor is a person or entity who is undertaking the performance of any part of the Work by virtue of a contract with the Contractor. The term "Subcontractor" means a Subcontractor or its authorized representatives.
- T. The Work: The Work is the construction and services required by the Contract Documents and includes all labor, materials, supplies, equipment, and other items and services as are necessary to produce the required construction and to fulfill the Contractor's obligations under the Contract. The Work may constitute the entire Project or only a portion of it.
- U. The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.
- V. Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

PART 2 PRODUCTS - NOT USED**PART 3 EXECUTION - NOT USED****END OF SECTION**

SECTION 01 5000**TEMPORARY FACILITIES AND CONTROLS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary telephone service.
- D. Temporary sanitary facilities.
- E. Temporary Controls: Barriers, enclosures, and fencing.
- F. Security requirements.
- G. Vehicular access and parking.
- H. Waste removal facilities and services.
- I. Project identification sign.
- J. Field offices.

1.02 TEMPORARY UTILITIES

- A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- B. Existing facilities may not be used.
- C. New permanent facilities may not be used.
- D. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.03 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
- C. Provide, maintain and pay for facsimile service and a dedicated telephone line to field office at time of project mobilization.

1.04 TEMPORARY SANITARY FACILITIES

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

1.05 BARRIERS

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

1.06 FENCING

- A. Construction: Commercial grade chain link fence.
- B. Provide 8 foot high fence around construction site; equip with vehicular and pedestrian gates with locks and deterrent course around the top of the assembly at Contractor's option.

1.07 EXTERIOR ENCLOSURES

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.08 INTERIOR ENCLOSURES

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

1.09 SECURITY

- A. Provide security and facilities to protect Work, existing facilities, and The Owner's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with The Owner's security program.

1.10 VEHICULAR ACCESS AND PARKING

- A. Coordinate access and haul routes with governing authorities and The Owner.
- B. Provide and maintain access to fire hydrants, free of obstructions.
- C. Provide means of removing mud from vehicle wheels before entering streets.
- D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.
- E. Designate one parking space for The Owner and The Architect use.

1.11 WASTE REMOVAL

- A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
- B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- C. Provide containers with lids. Remove trash from site periodically.
- D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.12 PROJECT IDENTIFICATION

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

1.13 FIELD OFFICES

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 10 persons.
- C. Locate offices a minimum distance of 30 feet from existing and new structures.

1.14 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.

- D. Restore existing facilities used during construction to original condition.
- E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

- 3.01 Provide Code Compliant Construction per the following: Code of Federal Regulations (CFR) Title 29, Part 1910 General Industry Safety Health Standards and Part 1926 Safety and Health Standards for Construction Industry, NFPA 70E Standard for Electrical Safety in the workplace, DOE Hoisting and Rigging Standard, ANSI Z359.1 Safety Requirements for Personal Fall Arrest Systems and Components, and ANSI Z359.3 Safety Requirements for Positioning and Travel Restraint Systems.**

END OF SECTION

SECTION 01 6000**PRODUCT REQUIREMENTS****PART 1 GENERAL****1.01 SECTION INCLUDES**

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

1.02 RELATED REQUIREMENTS

- A. Document 00 2113 - Instructions to Bidders: Product options and substitution procedures prior to bid date.
- B. Section 01 4000 - Quality Requirements: Product quality monitoring.
- C. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- D. Section 22 0513 - Common Motor Requirements for Plumbing Equipment: Motors for plumbing equipment.

1.03 REFERENCE STANDARDS

- A. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content; Current Edition.
- B. CAN/CSA Z809 - National Standard for Sustainable Forest Management; CSA International Inc; 2008.
- C. NEMA MG 1 - Motors and Generators; 2014.
- D. GreenSeal GS-36 - Commercial Adhesives; Green Seal, Inc.; 2000.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

1.04 SUBMITTALS

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
 - 1. Submit within 15 days after date of Agreement.
 - 2. For products specified only by reference standards, list applicable reference standards.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS**2.01 NEW PRODUCTS**

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. DO NOT USE products having any of the following characteristics:
 - 1. Made outside the United States, its territories, Canada, or Mexico.

2. Made using or containing CFC's or HCFC's.
 3. Made of wood from newly cut old growth timber.
- C. Where all other criteria are met, The Contractor shall give preference to products that:
1. If used on interior, have lower emissions, as defined in Section 01 6116.
 2. If wet-applied, have lower VOC content, as defined in Section 01 6116.
 3. Are extracted, harvested, and/or manufactured closer to the location of the project.
 4. Have longer documented life span under normal use.
 5. Result in less construction waste.
 6. Are made of vegetable materials that are rapidly renewable.
 7. Have a published GreenScreen Chemical Hazard Analysis.
- D. Regionally-Sourced Products:
1. Overall Project Requirement: Provide materials amounting to a minimum of 10 percent of the total value of all materials (excluding plumbing, HVAC, electrical, elevators, and other equipment) that have been extracted, harvested, or recovered, as well as manufactured, within a radius of 500 miles from the project site.
 - a. This provision is applicable to LEED Credit MR 5.1; show quantity on LEED report.
 2. Specific Product Categories: Provide regionally-sourced products as specified elsewhere.
- E. Products with Rapidly Renewable Material Content:
1. Definition: Materials made from plants that are typically harvested within 10 years or less after planting.
 2. Overall Project Requirement: Provide materials amounting to a minimum of 2.5 percent of the total value of all materials and products used on the project.
 3. Specific Product Categories: Provide renewable material content as specified elsewhere.
 4. Calculations: Where information about renewable material content is required to be submitted and an item is not made completely of rapidly renewable material, calculate content by dividing the renewable material content by weight by the total weight of the item.
- F. Products with Recycled Content:
1. Specific Product Categories: Provide recycled content as specified elsewhere.
 2. Calculations: Where information about recycled content is required to be submitted:
 - a. Determine percentage of post-consumer and post-industrial content separately, using the guidelines contained in 16 CFR 260.7(e).
 - b. Previously used, reused, refurbished, and salvaged products are not considered recycled.
 - c. Wood fabricated from timber abandoned in transit to original mill is considered reused, not recycled.
 - d. Determine percentage of recycled content of any item by dividing the weight of recycled content in the item by the total weight of all material in the item.
 - e. Determine value of recycled content of each item separately, by multiplying the content percentage by the value of the item.
- G. Sustainably Harvested Wood:
1. Definition: Wood-based materials include but are not limited to structural framing, dimension lumber, flooring, wood doors, finishes, and furnishings that are permanently installed in the project. Wood and wood-based products not permanently installed in the project are not included in the definition.
 2. Overall Project Requirement: Provide a minimum of 50 percent of all wood-based materials made of sustainably harvested wood.
 3. Specific Wood-Based Fabrications: Fabricate of sustainably harvested wood when so specified elsewhere.
 4. Certification: Provide wood certified or labeled by an organization accredited by one of the following:
 - a. American Forest Foundation, The American Tree Farm System; refer to <http://www.treefarmssystem.org>.
 - b. CSA International, under CAN/CSA Z809; refer to <http://certifiedwood.csa.ca>.
 - c. The Forest Stewardship Council, The Principles for Natural Forest Management; for Canada visit <http://www.fsccanada.org>, for the USA visit <http://www.fscus.org>.
 - d. Sustainable Forestry Board, under The Sustainable Forestry Initiative® of the American Forest & Paper Association; refer to <http://www.afandpa.org>.
 5. Submittals: State unit cost of each wood-based item, quantity installed, quantity certified as sustainably harvested, total wood-based material cost, and total sustainably harvested value; provide letter of certification

signed by supplier of each item, indicating compliance with the specified requirements and identifying the certifying organization.

- a. Include the certifying organization's certification numbers for each certified product, itemized on a line-item basis.
 - b. Attach copies of invoices bearing the certifying organization's certification numbers.
- H. Urea-Formaldehyde Prohibition:
1. Overall Project Requirement: Provide composite wood and agrifiber products having no added urea-formaldehyde resins.
 - a. Require each installer to certify compliance and submit product data showing product content.
 2. Specific Product Categories: Comply with limitations specified elsewhere.
- I. Adhesives and Joint Sealants:
1. Definition: This provision applies to gunnable, trowelable, and liquid-applied adhesives, sealants, and sealant primers used anywhere on the interior of the building inside the weather barrier, including duct sealers.
 2. Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.
 - a. Require each installer to certify compliance and submit product data showing product content.
 3. Specific Product Categories: Comply with limitations specified elsewhere.
- J. Aerosol Adhesives:
1. Provide only products having lower volatile organic compound (VOC) content than required by GreenSeal GS-36.
 2. Specific Product Categories: Comply with limitations specified elsewhere.
- K. Provide interchangeable components of the same manufacture for components being replaced.
- L. Motors: Refer to Section 22 0513 - Common Motor Requirements for Plumbing Equipment, NEMA MG 1 Type. Specific motor type is specified in individual specification sections.
- M. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.
- N. Cord and Plug: Provide minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

2.02 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.03 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

- A. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period and the documents required. Comply with requirements specified in Section 00 2113.
- B. The Architect will consider requests for substitutions only within 15 days after date of Agreement.
- C. Substitutions may be considered when a product becomes unavailable through no fault of the The Contractor.

- D. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- E. A request for substitution constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to The Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
 - 5. Agrees to reimburse The Owner and The Architect for review or redesign services associated with re-approval by authorities.
- F. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- G. Substitution Submittal Procedure (after contract award):
 - 1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
 - 2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
 - 3. The Architect will notify The Contractor in writing of decision to accept or reject request.

3.02 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- H. Comply with manufacturer's warranty conditions, if any.
- I. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

- J. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- K. Prevent contact with material that may cause corrosion, discoloration, or staining.
- L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- M. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 7419**CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL****PART 1 GENERAL****1.01 WASTE MANAGEMENT REQUIREMENTS**

- A. The Owner desires that this project generates the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Encouraged Recycling, Salvage, and Reuse: The following should not be disposed of in landfills or by incineration:
 - 1. Aluminum and plastic beverage containers.
 - 2. Corrugated cardboard.
 - 3. Wood pallets.
 - 4. Clean dimensional wood: May be used as blocking or furring.
 - 5. Concrete masonry units: May be used on project if whole, or crushed and used as sub-base material or fill.
 - 6. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
 - 7. Glass.
 - 8. Gypsum drywall and plaster.
 - 9. Plastic buckets.
 - 10. Carpet, carpet cushion, carpet tile, and carpet remnants : DuPont (<http://flooring.dupont.com>) and Interface (www.interfaceinc.com) conduct reclamation programs.
 - 11. Paint.
 - 12. Plastic sheeting.
 - 13. Rigid foam insulation.
 - 14. Windows, doors, and door hardware.
- E. A Recycling incentive program is highly encouraged for this project; The Contractor is responsible for implementation:
 - 1. Recycling: Revenue or savings shall accrue to The Contractor.
- F. The Contractor shall develop and follow his own a Waste Management Plan designed to implement these requirements.
- G. Methods of trash/waste disposal that are not acceptable are:
 - 1. Incineration on the project site.
 - 2. Incineration off the project site.
 - 3. Burying on the project site.
 - 4. Dumping or burying on other property, public or private.
 - 5. Other illegal dumping or burying.
 - 6. Storage of salvaged material on site.
- H. Regulatory Requirements: The Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

- A. Section 01 3000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. Section 01 5000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- C. Section 01 6000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

- D. Section 01 7000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.
- E. Section 31 1000 - Site Clearing: Handling and disposal of land clearing debris.

1.03 DEFINITIONS

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

PART 3 EXECUTION

2.01 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, The Owner, and The Architect.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - 1. Pre-bid meeting.
 - 2. Pre-construction meeting.
 - 3. Regular job-site meetings.
 - 4. Job safety meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. As a minimum, provide:
 - a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.

- b. Separate dumpsters for each category of recyclable.
 - c. Recycling bins at worker lunch area.
 - 2. Provide containers as required.
 - 3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
 - 4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
 - 5. Locate enclosures out of the way of construction traffic.
 - 6. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 - 7. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
 - 8. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 05 5000**METAL FABRICATIONS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Shop fabricated steel and aluminum items.

1.02 SUBMITTALS

- A. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- B. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

1.03 QUALITY ASSURANCE

- A. Design metal fabrications under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Alabama.

PART 2 PRODUCTS**2.01 MATERIALS - STEEL**

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- E. Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, plain.
- F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 MATERIALS - ALUMINUM

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- B. Bolts, Nuts, and Washers: Stainless steel.
- C. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.03 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by continuous welds.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 FABRICATED ITEMS

- A. Channels and Plates Not Attached to Structural Framing: For support of framing members; galvanized finish at exterior applications.

2.05 FINISHES - STEEL

- A. Prime paint steel items.
 - 1. Exceptions: Galvanize items specified for exterior finish, or exposed to exterior weather conditions.
 - 2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat.
- E. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.06 FINISHES - ALUMINUM

- A. Exterior Aluminum Surfaces: Class I color anodized.
- B. Comply with AA DAF-45 for aluminum finishes required.
- C. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

2.07 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components as indicated on drawings.
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 7300**DECORATIVE METAL RAILINGS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Railing and guardrail assemblies.
- B. Wall-mounted handrails.

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's product data including description of materials, components, finishes, fabrication details, glass, anchors, and accessories.
- B. Shop Drawings: Indicate railing system elevations and sections, details of profile, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories. Indicate anchor and joint locations, brazed connections, transitions, and terminations.
- C. Test Reports: Submit test reports from an independent testing agency showing compliance with specified design and performance requirements.
- D. Manufacturer's Installation Instructions.
- E. Maintenance Data: Manufacturer's instructions for care and cleaning.
- F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in The Owner's name and registered with manufacturer.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Approved and trained by Manufacturer of railing.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver railing materials in factory provided protective coverings and packaging.
- B. Protect railing materials against damage during transit, delivery, storage, and installation at site.
- C. Inspect railing materials upon delivery for damage. Repair damage to be indistinguishable from undamaged areas; if damage cannot be repaired to be indistinguishable from undamaged parts and finishes, replace damaged items.
- D. Prior to installation, store materials and components under cover, in a dry location.

1.05 FIELD CONDITIONS

- A. Do not install railings until project is enclosed and ambient temperature of space is minimum 65 degrees F and maximum 95 degrees F.
- B. Maintain ambient temperature of space at minimum 65 degrees F and maximum 95 degrees F for 24 hours before, during, and after railing installation.

1.06 WARRANTY

- A. Warranty: Manufacturer's standard one year warranty against defects in materials, fabrication, finishes, and installation commencing on Date of Substantial Completion.

PART 2 PRODUCTS**2.01 RAILING SYSTEMS**

- A. Railings - General: Factory- or shop-fabricated in design indicated, to suit specific project conditions, and for proper connection to building structure, and in largest practical sizes for delivery to site.
 - 1. Design Criteria: Design and fabricate railings and anchorages to resist the following loads without failure, damage, or permanent set; loads do not need to be applied simultaneously.
 - a. Lateral Force: 200 lb minimum, at any point, when tested in accordance with ASTM E935.
 - b. Distributed Load: 50 pounds per foot minimum, applied in any direction at the top of the handrail, when tested in accordance with ASTM E935.
 - c. Concentrated Loads on Intermediate Rails: 50 pounds per square ft, minimum.

2. Assembly: Join lengths, seal open ends, and conceal exposed mounting bolts and nuts using welded mechanical fittings, flanges, escutcheons, and wall brackets.
 3. Joints: Tightly fitted and secured, machined smooth with hairline seams.
 4. Field Connections: Provide sleeves to accommodate site assembly and installation.
 5. Welded and Soldered Joints: Make exposed joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
- B. Post Railing System: Engineered, post supported railing system with steel tube infill rails.
1. Top Cap: 1-1/2 inch round steel tube ; _____.
 2. Posts: 1-1/2 inch round steel tube.
 3. Infill / intermediate pickets
 - a. Configuration: As shown on drawings.
 - b. Material: steel.
 - c. Mounting: As detailed.
- C. Wall-Mounted Handrail:
1. 1-1/2 inch round steel tube; .
 2. Internal Connection Sleeves: Sleeve, material compatible with handrail and top cap material.
 3. Handrail Brackets: Manufacturer's standard steel brackets.

2.02 ACCESSORIES

- A. Welding Fittings: Factory- or shop-welded from matching pipe or tube; joints and seams ground smooth.
- B. Anchors and Fasteners: Provide anchors and other materials as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
1. For anchorage to concrete, provide inserts to be cast into concrete for bolting anchors.
 2. For anchorage to stud walls, provide backing plates for bolting anchors.
 3. Posts: Provide adjustable flanged brackets.
 4. Exposed Fasteners: No exposed bolts or screws.
- C. Hydraulic Expansion Cement: ASTM C1107/C1107M.
- D. Bituminous Coating: Cold-applied asphalt mastic, noncorrosive compound free of asbestos, sulfur, and other deleterious impurities; 0.015 inch dry film thickness per coat..
- E. Sealant: Silicone; Color as selected.
- F. Finish Touch-Up Materials: As recommended by manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate and site conditions are acceptable and ready to receive work.
- B. Verify field dimensions of locations and areas to receive work.
- C. Notify The Architect immediately of conditions that would prevent satisfactory installation.
- D. Do not proceed with work until detrimental conditions have been corrected.
- E. Furnish components to be installed in other work to installer of that other work, including but not limited to blocking, sleeves, inserts, anchor bolts, embedded plates and supports for attachment of anchors.

3.02 PREPARATION

- A. Protect existing work.
- B. Review installation drawings before beginning installation. Coordinate diagrams, templates, instructions and directions for installation of anchorages and fasteners.
- C. Clean surfaces to receive units. Remove materials and substances detrimental to the installation.

3.03 INSTALLATION

- A. Comply with manufacturer's drawings and written instructions.

- B. Install components plumb and level, accurately fitted, free from distortion or defects and with tight joints, except where necessary for expansion.
- C. Anchor securely to structure.
- D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- E. Isolate dissimilar materials with bituminous coating, bushings, grommets or washers to prevent electrolytic corrosion.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/8 inch per 3.5 feet of height level,.
- B. Maximum Offset From True Alignment: 1/8 inch per run of 8 feet, non cumulative.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 06 1000**ROUGH CARPENTRY****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Structural dimension lumber framing.
- B. Non-structural dimension lumber framing.
- C. Rough opening framing for doors, windows, and roof openings.
- D. Structural floor, wall, and roof and ceiling framing.
- E. Built-up structural footings, beams and columns.
- F. Sheathing.
- G. Roofing nailers.
- H. Preservative treated wood materials.
- I. Miscellaneous framing and sheathing.
- J. Communications and electrical room mounting boards.
- K. Concealed wood blocking, nailers, and supports.
- L. Miscellaneous wood nailers, furring, and grounds.

1.02 REFERENCE STANDARDS

- A. ANSI A208.1 - American National Standard for Particleboard; 2009.
- B. AFPA (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2012.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- E. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2014.
- F. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- H. AWPA C9 - Plywood -- Preservative Treatment by Pressure Processes; American Wood-Preservers' Association; 2003.
- I. AWPA C20 - Structural Lumber -- Fire Retardant Treatment by Pressure Processes; American Wood-Preservers' Association; 2002.
- J. AWPA C27 - Plywood -- Fire-Retardant Treatment by Pressure Processes; American Wood-Preservers' Association; 2002.
- K. AWPA U1 - Use Category System: User Specification for Treated Wood; 2012.
- L. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers; ICC Evaluation Service, Inc; 2013.
- M. PS 1 - Structural Plywood; 2009.
- N. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
- O. PS 20 - American Softwood Lumber Standard; 2010.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials and application instructions.
- C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

- A. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.
 - 1. Lumber of other species or grades, or graded by other agencies, is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.
- B. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
- C. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

1.05 QUALIFICATIONS

- A. Design structural site fabricated wood structural items under direct supervision of a Professional Structural Engineer experienced in design of such items and licensed in Alabama.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Trusses: Protect pre-engineered, shop fabricated trusses from warping or other distortion by stacking in vertical position, braced to resist movement.
- C. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS**2.01 GENERAL REQUIREMENTS**

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: Spruce-Pine-Fir (South), unless otherwise indicated.
 - 2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
- B. Lumber sawn from old growth timber is not permitted.
- C. Provide wood harvested within a 500 mile radius of the project site; see Section 01 6000 for requirements for locally-sourced products.
- D. Lumber fabricated from recovered timber (abandoned in transit) is permitted in lieu of sustainably harvested lumber, unless otherwise noted, provided it meets the specified requirements for new lumber and is free of contamination; identify source.

2.02 DIMENSION LUMBER

- A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Stud Framing (2 by 2 through 2 by 6):
 - 1. Species: Spruce Pine Fir (SPF).
 - 2. Grade: No. 2.
- E. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):
 - 1. Species: Southern Pine.
 - 2. Grade: No. 1 & Btr.
- F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.

2. Boards: Standard or No. 3.
- G. Miscellaneous Blocking, Furring, and Nailers:
 1. Lumber: S4S, No. 2 or Standard Grade.
 2. Boards: Standard or No. 3.

2.03 EXPOSED BOARDS

- A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.
- B. Moisture Content: Kiln-dry (15 percent maximum).
- C. Surfacing: S4S.
- D. Species: Southern Pine.
- E. Grade: No. 1, 1 Common, or Select.

2.04 CONSTRUCTION PANELS

- A. Subfloor/Underlayment Combination: Any PS 2 type, rated Single Floor.
 1. Bond Classification: Exterior.
 2. Span Rating: 48.
 3. Performance Category: 1-1/8 PERF CAT.
 4. Thickness: 3/4 inches, nominal.
 5. Edges: Tongue and groove.
- B. Roof Sheathing: APA PRP-108, Structural I Rated Sheathing, Exposure 1, and as follows:
 1. Span Rating: 24/0.
 2. Thickness: 3/4 inch, nominal, 3/4 inch (18mm) where noted.
 3. T1-11 Sheathing where noted.
- C. Wall Sheathing: APA PRP-108, Structural I Rated Sheathing, Exterior Exposure Class, and as follows:
 1. Span Rating: 24/0.
 2. Thickness: 1/2 inch, nominal.

2.05 ACCESSORIES

- A. Fasteners and Anchors:
 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
- B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
 1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.
- C. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
 1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.
- D. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.
- E. Sill Flashing: As specified in Section 07 6200.
- F. Subfloor Glue: Waterproof, air cure type, cartridge dispensed.
- G. Water-Resistive Barrier: Plastic sheet complying with ICC-ES AC38.
- H. Termite Shield: Galvanized sheet steel, .056 inch thick.

2.06 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

PART 3 EXECUTION**3.01 PREPARATION**

- A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.
- B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 FRAMING INSTALLATION

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- D. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- E. Install structural members full length without splices unless otherwise specifically detailed.
- F. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AFPA (WFCM) Wood Frame Construction Manual.
- G. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.
- H. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
- I. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, cabinets, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.
- C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- E. Provide the following specific non-structural framing and blocking:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Wall-mounted door stops.
 - 7. Wall paneling and trim.
 - 8. Joints of rigid wall coverings that occur between studs.

3.05 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.06 INSTALLATION OF ACCESSORIES AND MISCELLANEOUS WOOD

- A. Place full width continuous sill flashings under framed walls on cementitious foundations. Lap flashing joints 4 inches and seal.
- B. Place sill gasket directly on sill flashing. Puncture gasket cleanly and fit tightly to protruding foundation anchor bolts.
- C. Coordinate installation of prefabricated wood trusses.

3.07 INSTALLATION OF CONSTRUCTION PANELS

- A. Subflooring/Underlayment Combination: Glue and Screw to framing; staples are not permitted.
- B. Subflooring: Glue and Screw to framing; staples are not permitted.
- C. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
 - 1. Use sheathing clips between roof framing members with square edged panels.
 - 2. Provide solid edge blocking between sheets.
 - 3. Screw panels to framing; staples are not permitted.
- D. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using screws.
 - 1. Use plywood or other acceptable structural panels at building corners, for not less than 96 inches, measured horizontally, or as detailed.
- E. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
 - 1. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 - 2. Install adjacent boards without gaps.

3.08 SITE APPLIED WOOD TREATMENT

- A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.
- B. Allow preservative to dry prior to erecting members.

3.09 TOLERANCES

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.
- C. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.10 CLEANING

- A. Waste Disposal: Comply with the requirements of Section 01 7419 - Construction Waste Management and Disposal.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.
 - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

3.11 SCHEDULES See Drawings**END OF SECTION**

SECTION 06 1500**WOOD DECKING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Softwood lumber structural wood decking.
- B. Preservative treatment of wood.

1.02 REFERENCE STANDARDS

- A. AITC 112 - Standard for Tongue-and-Groove Heavy Timber Roof Decking; 1993 and errata.
- B. AWPA U1 - Use Category System: User Specification for Treated Wood; 2012.
- C. SPIB (GR) - Grading Rules; 2014.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate deck framing system, loads and cambers, bearing details, and framed openings.

1.04 QUALITY ASSURANCE**1.05 REGULATORY REQUIREMENTS**

- A. Conform to applicable code for fire retardant requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS**2.01 WOOD MATERIALS**

- A. Wood fabricated from old growth timber is not permitted.
- B. Provide wood harvested within a 500 mile radius of the project site.
- C. Lumber salvaged from deconstruction or demolition of existing buildings or structures is permitted in lieu of sustainably harvested lumber provided it is clean, denailed, and free of paint and finish materials, and other contamination; identify source.
- D. Lumber Decking: Fabricated to AITC 112.
 - 1. Species: Southern Yellow Pine, graded under SPIB rules as AITC Select quality.
 - 2. Size: 2 by 6 inches, nominal.
 - 3. Pattern: AITC standard beveled V-joint with single tongue and groove.
 - 4. Moisture Content: 19 percent, maximum.

2.02 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Fastener Type and Finish: Hot-dipped galvanized steel for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
 - 2. Screws: Bugle head, hardened steel, power driven type, length three times thickness of decking.
- B. Adhesive: Waterproof, air cure type, cartridge dispensed.

2.03 WOOD TREATMENT

- A. Factory-Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
- B. Preservative Pressure Treatment:
 - 1. Preservative Pressure Treatment of Lumber Decking: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.25 lb/cu ft retention.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that support framing is ready to receive decking.

3.02 INSTALLATION - BOARD DECKING

- A. Install decking perpendicular to framing members, with ends staggered over firm bearing.
- B. Engage decking tongue and groove edges.
- C. Secure with fasteners. Side spike planks together, through pre-drilled holes.

3.03 TOLERANCES

- A. Surface Flatness of Decking Without Load: 1/4 inch in 10 feet maximum, and 1/2 inch in 30 feet maximum.

END OF SECTION

SECTION 06 1733**WOOD I-JOISTS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Wood I-joists for floor framing.
- B. Bridging, bracing, and anchorage.
- C. Preservative treatment of wood.

1.02 REFERENCE STANDARDS

- A. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions; 2012a.
- B. ASTM D5055 - Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists; 2013.
- C. AWPA U1 - Use Category System: User Specification for Treated Wood; 2012.
- D. PS 1 - Structural Plywood; 2009.
- E. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's literature describing materials, dimensions, allowable spans and spacings, bearing and anchor details, bridging and bracing requirements, and installation instructions; identify independent inspection agency.
- B. Shop Drawings: Indicate sizes and spacing of joists, bracing and bridging, bearing stiffeners, holes to be cut (if any), and framed openings between joists.
- C. Certificate: Certification by joist manufacturer that products delivered are of the same design and construction as those evaluated by the independent inspection agency.

1.04 QUALITY ASSURANCE

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

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in manufacturer's original packaging with manufacturer's name and product identification intact and legible.
- B. Protect products from damage due to weather and breakage.
- C. Protect joists from warping or other distortion by stacking in upright position, braced to resist movement, with air circulation under coverings and around stacks.
- D. Handle individual joists in the upright position.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Wood I-Joists: Solid lumber top and bottom flanges and oriented strand board (OSB) webs bonded together with structural adhesive, with published span rating to meet project requirements.
 - 1. Span Rating: Established and monitored in accordance with ASTM D5055 by independent inspection agency.
 - 2. Oriented Strand Board: Comply with PS 2.
 - 3. Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.
 - 4. Depth: 9-1/2 inches.
 - 5. Fabrication Tolerances:
 - a. Flange Width: Plus/minus 1/32 inch.
 - b. Flange Thickness: Minus 1/16 inch.

- c. Joist Depth: Plus 0, minus 1/8 inch.
- 6. Marking: Mark each piece with depth, joist spacing, and allowable span for joist spacing.
- B. Wood-Based Components:
 - 1. Wood fabricated from old growth timber is not permitted.
 - 2. Provide wood harvested within a 500 mile radius of the project site.
 - 3. Wood fabricated from timber recovered from riverbeds or otherwise abandoned is permitted, unless otherwise noted, provided it is clean and free of contamination; identify source; provide lumber re-graded by an inspection service accredited by the American Lumber Standard Committee, Inc.
- C. Joist Bridging: Type, size and spacing recommended by joist manufacturer.
- D. Fasteners: Electrogalvanized steel, type to suit application.
- E. Bearing Plates: Electrogalvanized steel, unfinished.

2.02 WOOD TREATMENT

- A. Factory-Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that supports and openings are ready to receive joists.
- B. Verify that field measurements are as indicated on shop drawings.

3.02 PREPARATION

- A. Coordinate placement of bearing items.

3.03 ERECTION

- A. Install joists in accordance with manufacturer's instructions.
- B. Set structural members level and plumb, in correct position.
- C. Make provisions for erection loads and for sufficient temporary bracing to maintain structure plumb and in true alignment until completion of erection and installation of permanent bracing.
- D. Install permanent bridging and bracing.

3.04 TOLERANCES

- A. Framing Members: 1/2 inch maximum, from true position.

END OF SECTION

SECTION 06 1753**SHOP-FABRICATED WOOD TRUSSES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Shop fabricated wood trusses for roof framing.
- B. Bridging, bracing, and anchorage.

1.02 DESIGN REQUIREMENTS

- A. Comply with International Building Code 2015 Edition for structural loading criteria including wind and snow loads..

1.03 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on plate connectors, bearing plates, and metal bracing components.
- B. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing.
 - 1. Include identification of engineering software used for design.
 - 2. Provide shop drawings stamped or sealed by design engineer licensed in the State of Alabama.

1.04 QUALITY ASSURANCE

- A. Truss Design, Fabrication, and Installation: In accordance with TPI 1, TPI DSB-89, and BCSI 1.
- B. Designer Qualifications: Perform design by or under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Alabama.
- C. Fabricator Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.
- D. Designer Qualifications: Perform design by or under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Alabama.
- E. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Handle and erect trusses in accordance with TPI BCSI 1.
- B. Store trusses in vertical position resting on bearing ends.

1.06 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.

PART 2 PRODUCTS**2.01 TRUSSES**

- A. Wood Trusses: Designed and fabricated in accordance with TPI 1 and TPI DSB-89 to achieve structural requirements indicated.
 - 1. Connectors: Steel plate.

2.02 MATERIALS

- A. Lumber:
 - 1. Species: Spruce Pine Fir (SPF).
 - 2. Grade: SPIB (GR), As Required.
 - 3. Moisture Content: Between 7 and 9 percent.
 - 4. Lumber fabricated from old growth timber is not permitted.
 - 5. Provide sustainably harvested lumber, certified or labeled as specified in Section 01 6000.
- B. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G90/Z275 coating; die stamped with integral teeth; thickness as indicated.
- C. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

2.03 ACCESSORIES

- A. Wood Blocking and Framing for Openings: Softwood lumber, S/P/F species, construction grade, 19 percent maximum and 7 percent minimum moisture content.
- B. Fasteners: Hot-dip galvanized steel, type to suit application.
- C. Bearing Plates: Hot-dip galvanized steel.

2.04 FABRICATION

- A. Fabricate trusses to achieve structural requirements specified.
- B. Brace wood trusses in accordance with TPI DSB-89 and BCSI 1.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that supports and openings are ready to receive trusses.

3.02 PREPARATION

- A. Coordinate placement of bearing items.

3.03 ERECTION

- A. Install trusses in accordance with manufacturer's instructions and TPI DSB-89 and TPI BCSI 1; maintain a copy of each TPI document on site until installation is complete.
- B. Set members level and plumb, in correct position.
- C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in true alignment until completion of erection and installation of permanent bracing.
- D. Do not field cut or alter structural members without approval of The Architect's Structural Engineer.
- E. Install permanent bridging and bracing.
- F. Install headers and supports to frame openings required.
- G. Frame openings between trusses with lumber in accordance with Section 06 1000.
- H. Coordinate placement of decking with work of this section.
- I. After erection, touch-up galvanized surfaces with zinc primer.

3.04 TOLERANCES

- A. Framing Members: 1/2 inch maximum, from true position.

3.05 SCHEDULES See Drawings**END OF SECTION**

SECTION 06 2000**FINISH CARPENTRY****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Finish carpentry items.
- B. Standing and running Trim.

1.02 REFERENCE STANDARDS

- A. ANSI A135.4 - American National Standard for Basic Hardboard; 2012.
- B. ANSI A208.1 - American National Standard for Particleboard; 2009.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.
- E. AWPA U1 - Use Category System: User Specification for Treated Wood; 2012.
- F. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2006, 8th Ed., Version 2.0.
- G. BHMA A156.9 - American National Standard for Cabinet Hardware; 2010.
- H. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2009.
- I. NHLA G-101 - Rules for the Measurement & Inspection of Hardwood & Cypress; 2011.
- J. PS 1 - Structural Plywood; 2009.
- K. PS 20 - American Softwood Lumber Standard; 2010.
- L. WDMA I.S. 4 - Industry Specification for Preservative Treatment for Millwork; 2013.
- M. WI (MAN) - Manual of Millwork; Woodwork Institute; 2003.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Provide data on fire retardant treatment materials and application instructions.
 - 2. Provide instructions for attachment hardware and finish hardware.
- C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Provide the information required by AWI/AWMAC/WI (AWS).
- D. Samples: Submit two samples of finish plywood, 24 by 24 inch in size illustrating wood grain and specified finish.
- E. Samples: Submit two samples of wood trim 12 inch long.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with AWI Architectural Woodwork Quality Standards Illustrated, Custom grade.
- B. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect work from unnecessary exposure to moisture, or environmental conditions which would damage components.

1.07 PROJECT CONDITIONS

- A. Sequence installation to ensure building is fully enclosed with temperature and humidity within accepted range.

- B. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

- A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI/AWMAC/WI (AWS) for Custom Grade.
- B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.
- C. Interior Woodwork Items: (See Drawings)

2.02 WOOD-BASED COMPONENTS

2.03 STANDING AND RUNNING TRIM: DIMENSIONAL:LUMBER

- A. Softwood Lumber: Eastern White Pine or Douglas Fir species, Plain sawn, maximum moisture content of 6 percent with vertical grain,.
- B. Engineered, Medium Density Fiberboard Dimensional Lumber: Nominal width and thickness as shown on drawings and Finish Schedule:
 - 1. INTERLAM, Surfaces Redefined Product: FORESCOLOR pre-finished, through color, engineered wood.
 - a. Provide and install engineered material in profiles and color / finish as scheduled: www.interlam-design.com.

2.04 SHEET MATERIALS

- A. Softwood Plywood, Not Exposed to View: Any face species, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.
- B. Softwood Plywood, Exposed to View: Face species as indicated, plain sawn, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.
- C. Particleboard: ANSI A208.1; Composed of wood chips, sawdust, or flakes of medium density, made with waterproof resin binders; of grade to suit application; sanded faces.
- D. Hardboard: ANSI A135.4; Pressed wood fiber with resin binder, Class 1 - Tempered, 1/4 inch thick, smooth one side (S1S).

2.05 ACCESSORIES

- A. Lumber for Shimming and Blocking: Softwood lumber of Spruce Pine Fir (SPF) species.
- B. Primer: as specified in Section 09 9000.
- C. Wood Filler: Oil base, tinted to match surface finish color.

2.06 WOOD TREATMENT

- A. Factory-Treated Lumber: Comply with requirements of AWWPA U1 - Use Category System for pressure impregnated wood treatments determined by use categories, expected service conditions, and specific applications.
- B. Provide identification on fire retardant treated material.
- C. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.
- D. Redry wood after pressure treatment to maximum 6 percent moisture content.

2.07 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.

- B. See Section Rough Carpentry for installation of recessed wood blocking.

3.02 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.03 TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

3.04 SCHEDULE (See Drawings)

END OF SECTION

SECTION 06 4100**ARCHITECTURAL WOOD CASEWORK****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Specially fabricated cabinet units.
- B. Countertops.
- C. Cabinet hardware.
- D. Factory finishing.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

1.03 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.
- B. BHMA A156.9 - American National Standard for Cabinet Hardware; 2010.
- C. ANSI A135.4 - American National Standard for Basic Hardboard; 2012.
- D. ANSI A208.1 - American National Standard for Particleboard; 2009.
- E. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2009.
- F. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.
- G. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.9).
- H. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.

1.04 SUBMITTALS

- A. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
- B. Product Data: Provide data for hardware accessories.
- C. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.
- D. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
- B. Perform work in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Custom quality, unless other quality is indicated for specific items.
- C. Perform cabinet construction in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Custom quality, unless other quality is indicated for specific items.
- D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.
- E. Manufacturer Qualifications: Member in good standing of the Architectural Woodwork Institute (AWI) and familiar with the AWI/AWMAC QSI.
- F. Quality Certification: Provide inspection and quality certification of completed custom cabinets in accordance with AWI/AWMAC Quality Certification Program.

1.06 MOCK-UP

- A. Provide mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, and plumbing accessories.

1.07 PRE-INSTALLATION MEETING

- A. Convene not less than one week before starting work of this section.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.

1.09 FIELD CONDITIONS

- A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS**2.01 CABINETS**

- A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI/AWMAC/WI (AWS) for Custom Grade.

2.02 PANEL MATERIALS

- A. Particleboard: ANSI A208.1; medium density industrial type as specified in AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, composed of wood chips bonded with moisture resistant adhesive where required (Sink base cabinets, toilet room vanities etc.), under heat and pressure; sanded faces; thickness as indicated; use for components indicated on drawings.
- B. Medium Density Fiberboard (MDF): ANSI A208.2; type as specified in AWI/AWMAC Architectural Woodwork Quality Standards Illustrated; composed of wood fibers pressure bonded with moisture resistant adhesive to suit application; sanded faces; thickness as required.
 - 1. Use for painted components and concealed components.
 - 2. Use as backing for plastic laminate unless otherwise indicated.
- C. Hardboard: AHA A135.4; Pressed wood fiber with resin binder, Class 1 - Tempered, 1/4 inch thick, smooth two sides (S2S); use for drawer bottoms, dust panels, and other components indicated on drawings.
- D. Hardwood Edgebanding: Use solid hardwood edgebanding matching species, color, grain, and grade for exposed portions of cabinetry.

2.03 LAMINATE MATERIALS

- A. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications and as scheduled.

2.04 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Fasteners: Size and type to suit application.
- C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- D. Concealed Joint Fasteners: Threaded steel.
- E. Grommets: Standard rubber grommets for cut-outs, in color as selected.

2.05 HARDWARE

- A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
- B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, US 10B finish, for nominal 1 inch spacing adjustments.
 - 1. Basis of Design Product: SH Series manufactured by Doug Mockett & Co..
- C. Work Surface Supports: Stamped metal sized to support full depth of top as shown in drawings.
 - 1. Basis of Design Product: SWS Series manufactured by Doug Mockett & Co.
 - 2. At Contractor's option provide work surface supports fabricated from plastic laminate clad panel material to match work tops and cabinets.

- D. Drawer and Door Pulls: Brass Geometric Rectangular Bin Pull - US 10B by EMTEK® an ASSA ABLOY Group company.
- E. Drawer Slides:
 - 1. Type: Full extension.
 - 2. Static Load Capacity: Commercial grade.
 - 3. Mounting: Side mounted.
 - 4. Stops: Integral type.
 - 5. Features: Provide self closing/stay closed type.
 - 6. Manufacturers:
 - a. Basis of Design Product: Accuride International, Inc; Product 3640: www.accuride.com.
- F. Hinges: European style concealed self-closing type, steel with polished finish.
 - 1. Manufacturers:
 - a. Basis of Design Product: Hardware Resources; Product Model # 22855-000 : www.hardwareresources.com.

2.06 SHOP TREATMENT OF WOOD MATERIALS

- A. Provide UL approved identification on fire retardant treated material.
- B. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.

2.07 FABRICATION

- A. Cabinet Style: As indicated on Drawings.
- B. Cabinet Doors and Drawer Fronts: As indicated.
- C. Drawer Construction Technique: As recommended by fabricator.
- D. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- E. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- F. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- G. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
 - 1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
 - 2. Cap exposed plastic laminate finish edges with material of same finish and pattern.

2.08 FACTORY FINISHING

- A. Sand work smooth and set exposed nails and screws.
- B. For opaque finishes, apply wood filler in exposed nail and screw indentations and sand smooth.
- C. Seal internal surfaces of cabinets with two coats of semi-gloss alkyd enamel over a primer where scheduled. Brush, or spray apply only.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of utilities, backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

- A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Use concealed joint fasteners to align and secure adjoining cabinet units.

- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- E. Secure cabinets to floor using appropriate angles and anchorages.
- F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

- A. Adjust installed work.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

3.05 SCHEDULES See Drawings

END OF SECTION

SECTION 07 2100**THERMAL INSULATION****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Board insulation at cavity wall construction and exterior wall behind scheduled wall finish.

1.02 REFERENCE STANDARDS

- A. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.
- B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2014.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- D. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2012.
- E. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2012.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics and performance criteria.
- C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.04 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Board Insulation:
 - 1. The Dow® Chemical Company.: www.dowchemical.com
 - 2. Owens Corning.: www.owenscorning.com
 - 3. Pactiv Corporation: www.greenguard.pactiv.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 APPLICATIONS

- A. Insulation Interior face Tilt Up Concrete Walls: Extruded polystyrene board.
- B. Insulation Above Lay-In Acoustical Ceilings: Batt insulation with no vapor retarder.

2.03 FOAM BOARD INSULATION MATERIALS

- A. Polyisocyanurate Board Insulation with Facers Both Sides: Rigid cellular foam, complying with ASTM C1289; Type I, aluminum foil both faces; Class 1, non-reinforced foam core.
 - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 - 3. Complies with fire resistance requirements shown on the drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
 - 4. Compressive Strength: 16 psi
 - 5. Board Size: 48 by 96 inch.
 - 6. Board Thickness: 3.5 inch, or as indicated on drawings.

2.04 ACCESSORIES

- A. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.
 - 1. Provide fasteners to accept both Batt insulation and board insulation material.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT EXTERIOR WALLS

- A. Install boards in most efficient / economical orientation on walls to minimize cutting and waste.
 - 1. Place boards to maximize adhesive contact.
 - 2. Install in running bond pattern.
 - 3. Butt edges and ends tightly to adjacent boards and to protrusions.
- B. Extend boards over expansion joints, unbonded to wall on one side of joint.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- D. Place 6 inch wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window and door frames. Tape seal in place to ensure continuity of vapor retarder and air seal.
- E. Tape insulation board joints.
- F. R-Value of 19 or better for open cell and 35 or better for closed cell

3.03 PROTECTION

- A. Do not permit installed insulation to be damaged, or wetted prior to its concealment.
- B. Notify Architect to inspect installation prior to concealment.

END OF SECTION

SECTION 07 2126**BLOWN INSULATION****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Exterior Walls: Loose insulation pneumatically placed and poured into wall spaces through access holes.

1.02 REFERENCE STANDARDS

- A. ASTM C739 - Standard Specification for Cellulosic Fiber (Wood-Base) Loose-Fill Thermal Insulation; 2011.
- B. ASTM C764 - Standard Specification for Mineral Fiber Loose-Fill Thermal Insulation; 2011.
- C. ASTM C1015 - Standard Practice for Installation of Cellulosic and Mineral Fiber Loose-Fill Thermal Insulation; 2006 (Reapproved 2011).

1.03 SYSTEM DESCRIPTION

- A. Materials of This Section: Provide continuity of thermal barrier at building enclosure elements, in conjunction with Section 07 2100.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, limitations .
- C. Manufacturer's Installation Instructions: Indicate procedure for preparation and installation.
- D. Certificates: Certify that products of this section meet or exceed specified requirements.

1.05 PROJECT CONDITIONS

- A. Coordinate the work with Section 07 2100 for placement of insulation materials.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Blown Insulation:
 - 1. CertainTeed Corporation; _____: www.certainteed.com.
 - 2. GreenFiber; _____: www.greenfiber.com.
 - 3. International Cellulose Corp: www.spray-on.com.
 - 4. Johns Manville; _____: www.jm.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

- A. Loose Fill Insulation: ASTM C764, mineral wool fiber type, nodulated for pour and bulk for pneumatic placement.
 - 1. Thermal Conductivity: 0.27 BTU in/(hr sq ft deg F).
 - 2. Total Thermal Resistance: R-value of 19.0 (deg F hr sq ft)/Btu.
- B. Ventilation Baffles: Formed plastic.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation.
- B. Verify that light fixtures have thermal cut-out device to restrict over-heating in soffit or ceiling spaces.
- C. Verify spaces are unobstructed to allow placement of insulation.

3.02 INSTALLATION

- A. Install insulation and ventilation baffle in accordance with ASTM C1015 and manufacturer's instructions.
- B. Place insulation pneumatically to completely fill stud, joist, and rafter spaces.
- C. Place insulation against baffles. Do not impede natural attic ventilation to soffit.

- D. Place against and behind mechanical and electrical services within the plane of insulation.
- E. Completely fill intended spaces. Leave no gaps or voids.
- F. Repair and reseal insulation access ports. Refinish to match disturbed work.

3.03 CLEANING

- A. Remove loose insulation residue.

3.04 SCHEDULES

- A. Attic Spaces not accessible by pneumatic equipment: Pour insulation between ceiling joists to achieve an R value of 30.

END OF SECTION

SECTION 07 4113**METAL ROOF PANELS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Architectural roofing system of preformed aluminum panels.
- B. Fastening system.
- C. Factory finishing.
- D. Accessories and miscellaneous components.

1.02 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.
- B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.
- D. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2009.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- F. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference; 2005 (Reapproved 2012).
- G. ASTM E1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference; 1995 (Reapproved 2011).
- H. ASTM E1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems; 2011.
- I. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Summary of test results, indicating compliance with specified requirements.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Specimen warranty.
- B. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
 - 1. Show work to be field-fabricated or field-assembled.
 - 2. Include structural analysis signed and sealed by qualified structural engineer, indicating conformance of roofing system to specified loading conditions.
- C. Selection Samples: For roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.
- D. Verification Samples: For roofing system specified, submit samples of minimum size 12 inches square, representing actual roofing metal, thickness, profile, color, and texture.
 - 1. Include typical panel joint in sample.
 - 2. Include typical fastening detail.
- E. Test Reports: Indicate compliance of metal roofing system to specified requirements.
- F. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in The Owner's name and are registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in the manufacture of roofing systems similar to those required for this project, with not less than 5 years of documented experience.

- B. Installer Qualifications: Company trained and authorized by roofing system manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Provide strippable plastic protection on prefinished roofing panels for removal after installation.
- B. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Finish Warranty: Provide manufacturer's special warranty covering failure of factory-applied exterior finish on metal roof panels and agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling within specified warranty period of 15 year period from date of Substantial Completion.
- C. Waterproofing Warranty: Provide manufacturer's warranty for weathertightness of roofing system, including agreement to repair or replace roofing that fails to keep out water within specified warranty period of 5 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ARCHITECTURAL METAL ROOF PANELS

- A. Architectural Metal Roofing: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.
- B. Metal Panels: Factory-formed panels with factory-applied finish.
 - 1. Profile: Standing seam, with minimum 1.0 inch seam height; concealed fastener system for field seaming with special tool.
 - 2. Texture: Smooth.
 - 3. Length: Full length of roof slope, without lapped horizontal joints.
 - 4. Width: Maximum panel coverage of 24 inches.

2.03 ATTACHMENT SYSTEM

- A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

2.04 PANEL FINISH

- A. Class I Color Anodized, Antique Bronze Color to match Architect's sample.

2.05 FABRICATION

- A. Panels: Fabricate and finish panels and accessory items at factory, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.
- B. Joints: Factory-install captive gaskets, sealants, or separator strips at panel joints to provide weathertight seals, eliminate metal-to-metal contact, and minimize noise from panel movements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify The Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Broom clean wood sheathing prior to installation of roofing system.

- B. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.
- C. Remove protective film from surface of roof panels immediately prior to installation. Strip film carefully, to avoid damage to prefinished surfaces.
- D. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.
- E. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.03 INSTALLATION

- A. Overall: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
 - 1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
 - 2. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.
- B. Accessories: Install all components required for a complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.
- C. Underlayment: Install water shedding underlayment and building paper slip sheet on roof deck before installing preformed metal roof panels. Secure by methods acceptable to roof panel manufacturer, minimizing use of metal fasteners. Apply from eaves to ridge in shingle fashion, overlapping horizontal joints a minimum of 2 inches and side and end laps a minimum of 3 inches. Offset seams in building paper and seams in roofing felt.
- D. Roof Panels: Install panels in strict accordance with manufacturer's instructions, minimizing transverse joints except at junction with penetrations.
 - 1. Form weathertight standing seams incorporating concealed clips, using an automatic mechanical seaming device approved by the panel manufacturer.
 - 2. Incorporate concealed clips at panel joints, and apply snap-on battens to provide weathertight joints.
 - 3. Provide sealant tape or other approved joint sealer at lapped panel joints.
 - 4. Install sealant or sealant tape, as recommended by panel manufacturer, at end laps and side joints.

END OF SECTION

SECTION 07 4646**FIBER CEMENT SIDING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Smooth board and plank fiber cement siding.

1.02 REFERENCE STANDARDS

- A. ASTM C1186 - Standard Specification for Flat Fiber Cement Sheets; 2008 (Reapproved 2012).

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 1. Manufacturer's requirements for related materials to be installed by others.
 2. Preparation instructions and recommendations.
 3. Storage and handling requirements and recommendations.
 4. Installation methods, including nail patterns.
- C. Test Report: Applicable model code authority evaluation report (e.g. ICC-ES).
- D. Maintenance Instructions: Periodic inspection recommendations and maintenance procedures.
- E. Warranty: Submit copy of manufacturer's warranty, made out in The Owner's name, showing that it has been registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum 3 years of experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store products under waterproof cover and elevated above grade, on a flat surface.

PART 2 PRODUCTS**2.01 SIDING**

- A. Lap Siding: Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186 Type A Grade II; with machined edges, for nail attachment.
 1. Style: Standard lap style and simulated Cedar Perfection (straight edge, random width in length of board) as shown on drawings. .
 2. Texture: Smooth.
 3. Length: 12 ft, nominal.
 4. Width (Height): 5-1/4 inches.
 5. Thickness: 5/16 inch, nominal.
 6. Finish: Unfinished.
 7. Warranty: 50 year limited; transferable.
 8. Fiber Cement Manufacturers:
 - a. James Hardie Building Products, Inc: www.jameshardie.com.
 - b. Nichiha USA, Inc: www.nichiha.com.
- B. Panel Siding: Vertically and horizontally oriented panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186 Type A Grade II; with machined edges, for nail attachment.
 1. Texture: Smooth.
 2. Length (Height): 96 inches, nominal.
 3. Width: 48 inches.
 4. Thickness: 5/16 inch, nominal.
 5. Finish: Factory applied topcoat.

6. Color: As selected by The Architect from manufacturers full range of available colors.
7. Warranty: 50 year limited; transferable.
8. Panel Siding Manufacturers:
 - a. James Hardie Building Products, Inc: www.jameshardie.com.
 - b. Nichiha USA, Inc: www.nichiha.com.

2.02 ACCESSORIES

- A. Trim: Same material and texture as siding.
- B. Fasteners: Galvanized or corrosion resistant; length as required to penetrate minimum 1-1/4 inch.
- C. Joint Sealer: As specified in Section 07 9005.
- D. Finish Paint: See Section 09900 - Painting.

PART 3 EXECUTION

3.01 PREPARATION

- A. Examine substrate and clean and repair as required to eliminate conditions that would be detrimental to proper installation.
- B. Verify that weather-resistive barrier has been installed correctly and completely.
- C. Do not begin until unacceptable conditions have been corrected.
- D. If substrate preparation is the responsibility of another installer, notify The Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Install weather-resistive barrier over entire substrate; lap and seal as required to shed water.
- B. Install sheet metal flashing:
 1. Above door and window trim and casings.
 2. Above horizontal trim in field of siding.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and recommendations.
 1. Read warranty and comply with all terms necessary to maintain warranty coverage.
 2. Install in accordance with conditions stated in model code evaluation report applicable to location of project.
 3. Use trim details indicated on drawings.
 4. Touch up all field cut edges before installing.
 5. Pre-drill nail holes if necessary to prevent breakage.
- B. Over Wood framing and Wood-Composite Sheathing: Fasten siding through sheathing into studs.
- C. Allow space for thermal movement between both ends of siding panels that butt against trim; seal joint between panel and trim with specified sealant.
- D. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses a minimum of 18 inches.
- E. Joints in Vertical Siding: Install Z-flashing in horizontal joints between successive courses of vertical siding.
- F. Do not install siding less than 6 inches from surface of ground nor closer than 2 inch to roofs, patios, porches, and other surfaces where water may collect.
- G. After installation, seal all joints except lap joints of lap siding. Seal around all penetrations. Paint all exposed cut edges.

3.04 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07 6200**SHEET METAL FLASHING AND TRIM****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, and Miscellaneous sheet metal fabricated items associated with roofing and roof drainage..
- B. Sealants for joints within sheet metal fabrications.

1.02 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- C. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 SUBMITTALS

- A. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- B. Samples: Submit two samples, 8 x 8 inch in size illustrating material of typical bayonet seam, valley condition, ridge condition, and junction to vertical dissimilar surface.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.
- B. Maintain one copy of each document on site.
- C. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 10 years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS**2.01 SHEET MATERIALS**

- A. Copper: ASTM B370, cold rolled 20 oz/sq ft thick; natural finish.

2.02 ACCESSORIES

- A. Fasteners: Same material and finish as flashing metal .
- B. Underlayment: Self adhering rubberized asphalt, 40 mils.
- C. Slip Sheet: ASTM D 2178, # 15, glass fiber roofing felt.
- D. Primer: Zinc chromate type.
- E. Protective Backing Paint: Zinc molybdate alkyd.
- F. Sealant to be Concealed in Completed Work: Non-curing butyl sealant.
- G. Sealant to be Exposed in Completed Work: ASTM C920; elastomeric sealant, 100 percent silicone with minimum movement capability of plus/minus 25 percent and recommended by manufacturer for substrates to be sealed; clear.

- H. Sealant: Type silicone specified in Section 07 9005.
- I. Plastic Cement: ASTM D4586/D4586M, Type I.
- J. Solder: ASTM B32; Sn50 (50/50) type.

2.03 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Fabricate cleats of same material as sheet, minimum 6 inches wide, interlocking with sheet.
- C. Form pieces in longest possible lengths.
- D. Hem exposed edges on underside 1/2 inch; miter seam and solder corners.
- E. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- F. Tin edges of copper sheet to be soldered. Solder shop formed metal joints. After soldering, remove flux. Wipe and wash solder joints clean. Weather seal joints.
- G. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- H. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.
- I. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.
- J. Fabricate snow guards as detailed.

2.04 GUTTER AND DOWNSPOUT FABRICATION See Section 07 7123

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

- A. Conform to drawing details.
- B. Secure flashings in place using concealed fasteners. Exposed fasteners including pop rivets are not permitted without approval.
- C. Apply plastic cement compound between metal flashings and felt flashings.
- D. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- E. Solder metal joints for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.

3.04 FIELD QUALITY CONTROL

- A. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

3.05 SCHEDULE See Drawings

END OF SECTION

SECTION 07 7100**ROOF SPECIALTIES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Manufactured roof specialties, including vents.

1.02 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 2012.
- B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels; 2013.
- C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2013.
- D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.
- E. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2012).
- F. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; Fifth Edition, with interim updates.
- G. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.
- H. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; 2011.

1.03 SUBMITTALS

- A. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.
- B. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.
- C. Manufacturer's Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) details.
 - 1. Maintain one copy on project site.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Roof Edge Flashings and Copings:
 - 1. Basis of Design W.P. Hickman Company; PermaSnap 2 Coping: www.wph.com.

2.02 COMPONENTS

- A. Roof Edge Flashings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.
 - 1. Configuration: Fascia, cant, and edge securement for roof membrane;
 - 2. Pull-Off Resistance: Tested in accordance with SPRI ES-1 RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable code.
 - 3. Material: Formed aluminum sheet, 0.063 inch thick, minimum.
 - 4. Finish: Color Anodized As selected by Architect from Manufacturer's full range of options..
 - 5. Color: To be selected by The Architect from manufacturer's full range.of options

2.03 ACCESSORIES

- A. Sealant: Type Silicone as specified in Section 07 9005.

2.04 FINISHES

- A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as scheduled, or if .

PART 3 EXECUTION
END OF SECTION

SECTION 07 7123**MANUFACTURED GUTTERS AND DOWNSPOUTS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Pre-finished aluminum gutters, and downspouts.

1.02 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.
- B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- C. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- D. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- E. ASTM D4479/D4479M - Standard Specification for Asphalt Roof Coatings - Asbestos-Free; 2007 (Reapproved 2012).
- F. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Conform to SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.
- B. Conform to applicable code for size and method of rain water discharge.
- C. Maintain one copy of each document on site.

1.04 SUBMITTALS

- A. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.
- B. Product Data: Provide data on prefabricated components.
- C. Samples: Submit two samples, 12x12 inches square illustrating component design, finish, color, and configuration.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.
- B. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. Copper: ASTM B370, cold rolled 0.22 inch thick; natural finish.
- B. Primer: Zinc molybdate type.
- C. Protective Backing Paint: Zinc molybdate alkyd.
- D. Solder: ASTM B32; Sn50 (50/50) type.

2.02 COMPONENTS

- A. Gutters: SMACNA rectangular style profile. (1/2 Round)
- B. Downspouts: SMACNA Round profile.
- C. Anchors and Supports: Profiled to suit gutters and downspouts.
 - 1. Anchoring Devices: In accordance with SMACNA requirements.
 - 2. Gutter Supports: Brackets.
 - 3. Downspout Supports: Standoff Brackets.
- D. Fasteners: Galvanized steel, with soft neoprene washers.

2.03 FABRICATION

- A. Form gutters, conductor heads and downspouts of profiles and sizes required to provide adequate unencumbered drainage..
- B. Fabricate with required connection pieces.
- C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
- D. Hem exposed edges of metal.
- E. Fabricate gutter and downspout accessories; seal watertight.

2.04 FINISHES

- A. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system; color as scheduled.
- B. Primer Coat: Finish concealed side of metal sheets with primer compatible with finish system, as recommended by finish system manufacturer.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that surfaces are ready to receive work.

3.02 PREPARATION

- A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

- A. Install gutters, conductor heads, downspouts, and accessories in accordance with manufacturer's instructions and Industry best practices.
- B. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts .
- C. Slope gutters 1/8" inch per foot toward outlet .

END OF SECTION

SECTION 07 9005**JOINT SEALERS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Sealants and joint backing.

1.02 REFERENCE STANDARDS

- A. ASTM C834 - Standard Specification for Latex Sealants; 2014.
- B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.
- E. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

1.03 SUBMITTALS

- A. Product Data: Provide data indicating sealant chemical characteristics.
- B. Manufacturer's Installation Instructions: Indicate special procedures.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum 5 years documented experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.

1.05 MOCK-UP

- A. Provide mock-up of sealant joints in conjunction with window under provisions of Section 01 4000.
- B. Construct mock-up with specified sealant types and with other components noted.

1.06 FIELD CONDITIONS

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

1.07 COORDINATION

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

1.08 WARRANTY

- A. Correct defective work within a five year period after Date of Substantial Completion.
- B. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Silicone Sealants:
 - 1. BASF Construction Chemicals-Building Systems: www.chemrex.com.
 - 2. Dow Corning ; www.dowcorning.com.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SEALANTS

- A. Sealants and Primers - General: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.
- B. Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.

- C. Type S-1 - General Purpose Exterior Sealant: Silicone; ASTM C 920, Grade NS, Class 50, Uses M, G, and A; single component.
 - 1. Color: color as selected.
 - 2. Product: DOW CORNING® 795 SILICONE BUILDING SEALANT manufactured by Dow Corning Corporation.
 - 3. Applications: Use for:
 - a. Control, expansion, and soft joints in masonry.
 - b. Joints between concrete and other materials.
 - c. Joints between metal frames and other materials.
 - d. General building joints at the exterior.
 - e. Other exterior joints for which no other sealant is indicated.
- D. Type S-2 - General Purpose Interior Sealant: One part Latex Cure RTV Silicone ; ASTM C 920, Grade NS, Class 50, single component, paintable.
 - 1. Color: Colors as selected.
 - 2. Product: DOW CORNING® PAINTABLE SEALANT manufactured by Dow Corning Corporation.
 - 3. Applications: Use for:
 - a. Interior wall and ceiling control joints.
 - b. Joints between door and window frames and wall surfaces.
 - c. Other interior joints for which no other type of sealant is indicated.
- E. Type S-3 - Bathtub/Tile Sealant: White silicone; ASTM C920, Uses I, M and A; single component, mildew resistant.
 - 1. Product: DOW CORNING® GENERAL PURPOSE SEALANT manufactured by Dow Corning.
 - 2. Applications: Use for:
 - a. Joints between plumbing fixtures and Bath floor and wall surfaces / Tile .
- F. Type S-4 - Concrete Paving Joint Sealant: Silicone, self-leveling; ASTM D5893-96, Class 100/50, Uses T, I, M and A; single component.
 - 1. Color: Color as selected.
 - 2. Product: DOW CORNING® 890-SL manufactured by Dow Corning Corporation.
 - 3. Applications: Use for:
 - a. Joints in sidewalks and vehicular paving.
- G. Type S-5 - Butyl Sealant: ASTM C 311, ASTM C 920, ASTM C 1085, Grade NS, Class 12 1/2, Uses NT, O; single component, solvent release, non-skinning, non-sagging.
 - 1. Color: Colors as selected.
 - 2. Product: Tremco Butyl Sealant manufactured by Tremco Commercial Sealants and Waterproofing.
 - 3. Movement Capability: Plus and minus 12-1/2 percent.
 - 4. Service Temperature Range: -13 to 180 degrees F.
 - 5. Shore A Hardness Range: 10 to 30.
 - 6. Applications: Use for:
 - a. Bedding Thresholds.
 - b. Concealed metal to metal flashing and gutter joints.

2.03 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

- B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

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

3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Perform acoustical sealant application work in accordance with ASTM C919.
- D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- E. Install bond breaker where joint backing is not used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- H. Tool joints concave.
- I. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.
- J. Compression Gaskets: Avoid joints except at ends, corners, and intersections; seal all joints with adhesive; install with face 1/8 to 1/4 inch below adjoining surface.

3.04 CLEANING

- A. Clean adjacent soiled surfaces.

3.05 PROTECTION

- A. Protect sealants until cured.

3.06 SCHEDULE

- A. Exterior Joints for Which No Other Sealant Type is Indicated: Type S-1; colors as selected.
- B. Joints Between Exterior Metal Frames and Adjacent Work (except masonry): Type S-1.
- C. Under Exterior Door Thresholds: Type S-5.
- D. Interior Joints for Which No Other Sealant is Indicated: Type S-2; colors as selected.
- E. Joints Between Plumbing Fixtures and Walls and Floors, and Between Countertops and Walls: Type S-3.

END OF SECTION

SECTION 08 1213**HOLLOW METAL FRAMES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Non-fire-rated hollow metal frames for non-hollow metal doors.

1.02 RELATED REQUIREMENTS

- A. Section 08 7100 - Door Hardware: Hardware, silencers, and weatherstripping.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.
- C. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames; 2007 (R2011).
- D. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.
- E. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.
- F. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.
- G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- H. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.
- I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2014.
- J. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2014.
- K. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.
- L. ICC A117.1 - Accessible and Usable Buildings and Facilities; International Code Council; 2009 (ANSI).
- M. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- N. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.
- O. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
- D. Samples: Submit one sample of frame metal, 2 inch by 2 inch, showing factory finishes, colors, and surface textures.
- E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- F. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store in accordance with applicable requirements and in compliance with standards and/or custom guidelines as indicated.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Hollow Metal Frames with Integral Casings:
 - 1. Ceco Door, an Assa Abloy Group company; _____: www.assaabloydss.com.
 - 2. Steelcraft, an Allegion brand; _____: www.allegion.com/sle.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DESIGN CRITERIA

- A. Refer to Door and Frame Schedule on the drawings for frame sizes, fire ratings, sound ratings, finishing, door hardware to be installed, and other variations, if any.
- B. Door Frame Type: Provide hollow metal door frames with integral casings.
- C. Steel used for fabrication of frames shall comply with one or more of the following requirements; Galvannealed steel conforming to ASTM A653/A653M, cold-rolled steel conforming to ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel conforming to ASTM A1011/A1011M, Commercial Steel (CS) Type B for each.
- D. Accessibility: Comply with ICC A117.1 and ADA Standards.
- E. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior frame that is also indicated as being sound-rated must comply with the requirements specified for exterior frames and for sound-rated frames; where two requirements conflict, comply with the most stringent.
- F. Hardware Preparations, Selections and Locations: Comply with BHMA A156.115, NAAMM HMMA 830 and NAAMM HMMA 831 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

2.03 HOLLOW METAL DOOR FRAMES WITH INTEGRAL CASINGS

- A. Frame Finish: Factory finished.
- B. Exterior Door Frames: Face welded, seamless with joints filled.
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 1 - Standard-duty.
 - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Frame Metal Thickness: 18 gage, 0.042 inch, minimum.
 - 2. Weatherstripping: Refer to Section 08 7100.

2.04 ACCESSORIES

- A. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

2.05 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
- B. Factory Finish: Complying with ANSI/SDI A250.3, manufacturer's standard coating.
- C. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION**3.01 EXAMINATION**

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

3.02 PREPARATION

- A. Coat inside of frames with bituminous coating to a thickness of 1/16 inch.

3.03 INSTALLATION

- A. Install frames in accordance with manufacturer's instructions and related requirements of specified frame standards or custom guidelines indicated.
- B. Install in accordance with the requirements of the specified door grade standard.
- C. Coordinate frame anchor placement with wall construction.
- D. Coordinate installation of hardware.

3.04 TOLERANCES

- A. Maximum Diagonal Distortion: 1/16 inch measured with straight edges, crossed corner to corner.

END OF SECTION

SECTION 08 1433**STILE AND RAIL WOOD DOORS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Factory Pre-finished solid wood doors, stile and rail design.
- B. Factory Pre-finished metal clad wood doors, stile and rail design.
- C. Panels of wood and glass.

1.02 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
- B. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.
- D. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2005, 8th Ed., Version 2.0.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate stile and rail core materials and construction; veneer species, type and characteristics.
- C. Specimen warranty.
- D. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, identify cutouts for glazing and louvers.
- E. Samples: Submit two samples of door construction, 12x12 inches in size cut from top corner of door.
- F. Samples: Submit two samples of door veneer, 24" x 24" inch in size illustrating wood grain, stain color, and sheen.
- G. Manufacturer's Installation Instructions: Indicate special installation instructions.
- H. Warranty, executed in The Owner's name.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with AWI/AWMAC Quality Standards Illustrated, Section 1400, Custom grade.
 - 1. Maintain one copy of standard on site.
- B. Factory finish doors in accordance with AWI/AWMAC Quality Standards Illustrated, Section 1500.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with AWI/AWMAC Quality Standards Illustrated, Section 1300.
- B. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.06 PROJECT CONDITIONS

- A. Coordinate the work with door opening construction, door frame and door hardware installation.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide warranty to the following term:
 - 1. Exterior Doors: Five (5) years.
 - 2. Interior Doors: For the life of the installation.

- C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, telegraphing core construction, and failure of core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Stile and Rail Wood Doors: Basis of Design
 - 1. Maiman Company: www.maiman.com.
- B. Stile and Rail Wood Doors: Other Acceptable Manufacturers
 - 1. Marshfield Door Systems, Inc: www.marshfielddoors.com.
 - 2. TruStile Doors LLC : www.trustile.com.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DOORS

- A. Quality Level: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS).
- B. Exterior Doors: 1-3/4 inches thick unless otherwise indicated; solid lumber construction; mortised and tenoned joints.
- C. Interior Doors: 1-3/8 inches thick unless otherwise indicated; solid lumber construction; mortise and tenon joints. Transparent finish where indicated on drawings.

2.03 DOOR AND PANEL FACINGS

- A. Veneer Facing for Transparent Finish: Natural Birch, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
- B. Adhesive: Type I - Waterproof.

2.04 COMPONENTS

- A. Glazed Openings:
 - 1. Heat-Strengthened and Fully Tempered Glass: ASTM C1048.
 - 2. Laminated Safety Glass: Comply with 16 CFR 1201 test requirements for Category II.
- B. Panel or Glass Retention Molding: Wood of same species as door facing, molded stop applied one-side, mitered corners; prepared for countersink style tamper proof screws.

2.05 DOOR CONSTRUCTION

- A. Fabricate in accordance with AWI/AWMAC Quality Standards Illustrated, Section 1400, Custom grade.
- B. Fabricate doors in accordance with AWI Quality Standards requirements.
- C. Vertical Exposed Edge of Stiles: Of same species as veneer facing.
- D. Fit door edge trim to edge of stiles after applying veneer facing.
- E. Bond edge banding to cores.
- F. At exterior doors, provide aluminum flashing at the top and bottom rail for full thickness and width of door.
- G. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.
- H. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- I. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
- J. Cut and configure exterior door edge to receive recessed weatherstripping devices. Provide edge clearances in accordance with referenced quality standards.

2.06 FACTORY FINISHING

- A. Finish work in accordance with AWI/AWMAC/WI (AWS), Section 5 - Finishing for grade specified and as follows:
- B. Factory finish doors in accordance with AWI Quality Standards Section 1500:
 - 1. Transparent Finish: Transparent catalyzed polyurethane, Custom quality, matte sheen.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out of tolerance for size or alignment.

3.02 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standards.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Field trimming doors is not permitted. If fit is not within specified tolerances without modification return door to manufacturer for modification, replace door, or replace door and frame.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.

3.03 TOLERANCES

- A. Conform to specified quality standard for fit, clearance, and joinery tolerances.
- B. Maximum Diagonal Distortion (Warp): 1/8 inch measured with straight edge or taut string, corner to corner, over an imaginary 36 x 84 inch surface area.
- C. Maximum Vertical Distortion (Bow): 1/8 inch measured with straight edge or taut string, top to bottom, over an imaginary 36 x 84 inch surface area.
- D. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taut string, edge to edge, over an imaginary 36 x 84 inch surface area.

3.04 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

3.05 SCHEDULE - See Drawings**END OF SECTION**

SECTION 08 5200**ALUMINUM CLAD WOOD WINDOWS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Factory fabricated wood windows.
- B. Glazing.
- C. Factory fabricated metal clad wood windows with fixed and operating sash.
- D. Perimeter sealant.
- E. Metal Clad Wood trim for exterior finish installation.

1.02 REFERENCE STANDARDS

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2011.
- B. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers; 2005.
- C. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004.
- D. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2002 (Reapproved 2010).
- E. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).
- F. ASTM F588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact; 2014.
- G. WDMA I.S.4 - Water-Repellent Preservative Non-Pressure Treatment for Millwork; National Wood Window and Door Association; 2009.

1.03 PERFORMANCE REQUIREMENTS

- A. Performance Requirements: As specified in PART 2, with the following additional requirements.
- B. Design and size windows to withstand dead loads and positive and negative wind loads acting normal to plane of wall calculated in accordance with ASCE 7 , when tested in accordance with ASTM E 330, using test loads equal to 1.5 times the design wind loads and 10 second duration of maximum load.
- C. Deflection: Limit member deflection to 1/200 with full recovery of glazing materials.
- D. Design windows to accommodate, without damage to components or deterioration of seals, movement between window and perimeter framing and deflection of lintel.
- E. Thermal Resistance of Assembly (Including Vision Areas): U value 0.30 .
- F. Thermal Resistance of Vision Areas: R value of (3.3).
- G. Solar Heat Gain Coefficient: 0.18
- H. Visible Light Transmittance : 0.50
- I. Air Infiltration: Limit air leakage through assembly to 0.1 cu ft/min/sq ft of wall area, measured at a reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E 283.
- J. Water Leakage: None, when measured in accordance with ASTM E 331.
- K. Air and Vapor Seal: Maintain continuous air and vapor barrier throughout assembly, primarily in line with inside pane of glass and inner sheet of infill panel and heel bead of glazing compound.
- L. Forced Entry Resistance: Conform to ASTM F 588 requirements for performance level 10 for window type A.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

- B. Product Data: Show component dimensions.
- C. Shop Drawings: Indicate opening dimensions.
- D. Submit two samples full size illustrating window frame section.
- E. Manufacturer's Certificate: Certify that products furnished meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with at least three years of documented experience.

1.06 PRE-INSTALLATION MEETING

- A. Convene one week before starting work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect factory finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F.
- B. Maintain this minimum temperature during and after installation of sealants.

1.09 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide Twenty year manufacturer warranty for insulating glass units from seal failure, interpane dusting or misting, and replacement of same.
- D. Warranty: Include coverage for the following:
 - 1. Degradation of color finish.
 - 2. Delamination or separation of finish cladding from window member.
 - 3. Deterioration of wood components.
 - 4. Failure of operating hardware of operable units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design .
 - 1. JELD-WEN, inc.; Product Custom Casement Series www.jeldwen.com.
- B. Wood Windows:
 - 1. Kolbe & Kolbe Millwork Inc.; Product Ultra Series Casements www.kolbe-kolbe.com
 - 2. Weather Shield Manufacturing, Inc.; ____: www.weathershield.com.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 WOOD WINDOWS

- A. Wood Windows: Wood frame and sash, factory fabricated and assembled.
 - 1. Grade: AAMA/WDMA/CSA 101/1.S.2/A440 C30.
 - 2. Exterior Finish: Metal clad, painted.
 - 3. Interior Finish: Primed.
 - 4. Exterior Surfaces: Metal clad, , color as selected.
 - 5. Interior Surfaces: Primed for field painting.
 - 6. Configuration: As indicated on drawings.
 - 7. Factory glazed; dry glazing method.
 - 8. Metal Cladding: Formed aluminum, factory finished, factory fit to profile of wood members.

2.03 COMPONENTS

- A. Glazing: Double glazed, clear, Low-E coated, argon filled, with glass thicknesses as recommended by manufacturer for specified wind conditions.
- B. Simulated Muntin Grid: Formed wood construction, configured openings as shown on drawings, color as selected.
- C. Simulated divided lites (SDL) to be provided.
- D. Fasteners: Stainless steel.
- E. Sealant and Backing Materials: As specified in Section 07 9200 of types as indicated.
- F. Accessories: Provide related flashings, and anchorage and attachment devices.
- G. Sealant for Setting Sills, Stools, Aprons, and Sill Flashing: Non-curing butyl type.

2.04 MATERIALS

- A. Wood: Clear pine, clear preservative treated in accordance with WDMA I.S.4 using treatment type suitable for transparent or opaque finish.
- B. Metal Cladding: Formed aluminum, factory finished, factory fit to profile of wood members.
- C. Glass and Glazing Materials: As specified in Section 08 8000 of Types described below:
 - 1. Glass in Exterior Lights: Type Clear, Low - e 366.
- D. Sealant and Backing Materials: As specified in Section 07 9005 of Types described below.
 - 1. Perimeter Sealant: Type Silicone.

2.05 ACCESSORIES

- A. None - All units are fixed.

2.06 FABRICATION

- A. Fabricate frame and sash members with mortise and tenon joints. Glue and steel pin joints to hairline fit, weather tight.
- B. Provide weather stop flange at entire perimeter of unit.
- C. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet allowing installation and dynamic movement of perimeter seal.
- D. Arrange fasteners to be concealed from view.
- E. Provide internal drainage of glazing spaces to exterior through weep holes.
- F. Factory glaze window units.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

- A. Install windows in accordance with manufacturer's instructions.
- B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- D. Install sills, stools, and aprons.
- E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- F. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- G. Install operating hardware.

- H. Install glass and infill panels in accordance with Section 08 8000.
- I. Install perimeter sealant and backing materials in accordance with Section 07 9005.

3.03 TOLERANCES

- A. Maximum Variation from Level or Plumb: 1/16 inch per 3 ft non-cumulative or 1/8 inch per 10 ft, whichever is less.

3.04 ADJUSTING

- A. Adjust hardware for smooth operation and secure weathertight closure.

3.05 CLEANING

- A. Remove protective material from factory finished surfaces.
- B. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.
- C. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION

SECTION 08 7100**DOOR HARDWARE****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Hardware for wood, aluminum, hollow metal, and _____ doors.
- B. Hardware for fire-rated doors.
- C. Thresholds.
- D. Weatherstripping, seals and door gaskets.
- E. Gate locks.

1.02 RELATED REQUIREMENTS

- A. Section 08 1213 - Hollow Metal Frames.
- B. Section 08 1433 - Stile and Rail Wood Doors.

1.03 PRICE AND PAYMENT PROCEDURES

- A. See Section 01 2100 - Allowances, for allowances affecting this section.

1.04 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.
- C. BHMA A156.1 - American National Standard for Butts and Hinges; 2013.
- D. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches; 2011.
- E. BHMA A156.3 - American National Standard for Exit Devices; 2014.
- F. BHMA A156.4 - American National Standard for Door Controls - Closers; 2013.
- G. BHMA A156.5 - American National Standard for Cylinders and Input Devices for Locks; 2014.
- H. BHMA A156.6 - American National Standard for Architectural Door Trim; 2010.
- I. BHMA A156.7 - American National Standard for Template Hinge Dimensions; 2014.
- J. BHMA A156.8 - American National Standard for Door Controls - Overhead Stops and Holders; 2010.
- K. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.9).
- L. BHMA A156.12 - American National Standard for Interconnected Locks; 2013.
- M. BHMA A156.13 - American National Standard for Mortise Locks & Latches Series 1000; 2012.
- N. BHMA A156.14 - American National Standard for Sliding and Folding Door Hardware; 2013.
- O. BHMA A156.15 - American National Standard for Release Devices - Closer Holder, Electromagnetic and Electromechanical; 2011.
- P. BHMA A156.16 - American National Standard for Auxiliary Hardware; 2013.
- Q. BHMA A156.17 - American National Standard for Self Closing Hinges & Pivots; 2014.
- R. BHMA A156.18 - American National Standard for Materials and Finishes; 2012.
- S. BHMA A156.21 - American National Standard for Thresholds; 2014.
- T. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association; 2012.
- U. DHI A115 Series - Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute; 2000.

- V. DHI A115W Series - Specifications for Wood Door and Frame Preparation for Hardware; Door and Hardware Institute; 2000.
- W. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; 2004.
- X. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors; 1993; also in WDHS-1/WDHS-5 Series, 1996.
- Y. ITS (DIR) - Directory of Listed Products; current edition.
- Z. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.
- AA. NFPA 101 - Life Safety Code; 2015.
- AB. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware will be installed upon.
- B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

1.06 SUBMITTALS

- A. Hardware Schedule: Hardware Supplier to provide comprehensive schedule of hardware sets for each type of door and the corresponding lock / latch function.
 - 1. Schedule to be prepared by Architectural Hardware Consultant in the employ of the Hardware Supplier.
- B. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- C. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project.
- D. Shop Drawings:
 - 1. Indicate locations and mounting heights of each type of hardware, schedules, catalog cuts, electrical characteristics and connection requirements, and _____.
- E. Samples: Prior to preparation of hardware schedule:
 - 1. Submit 1 sample of latchset and lockset illustrating style, color, and finish.
 - 2. Samples will be returned to supplier.
- F. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- G. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.
- H. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
 - 1. Submit manufacturer's parts lists and templates.
 - 2. Bitting List: List of combinations as furnished.
- I. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in The Owner's name and registered with manufacturer.

1.07 QUALITY ASSURANCE

- A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by The Architect and The Contractor.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- C. Hardware Supplier Qualifications: Company specializing in supplying the type of products specified in this section with at least three years documented experience.
- D. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this section.
 - 1. AHC to develop comprehensive hardware schedule

1.08 PRE-INSTALLATION MEETING

- A. Convene one week prior to commencing work of this section.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.10 COORDINATION

- A. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware.
- B. Furnish templates for door and frame preparation.
- C. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
- D. Coordinate The Owner's keying requirements during the course of the Work.

1.11 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year warranty for door closers and _____.

1.12 MAINTENANCE PRODUCTS

- A. Provide special wrenches and tools applicable to each different or special hardware component.
- B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

1.13 EXTRA MATERIALS

- A. Provide 2 extra key lock cylinders for each master keyed group.

PART 2 PRODUCTS**2.01 MANUFACTURERS - BASIS OF DESIGN**

- A. Electronic Locksets and Entry Hardware: Emtek®: an ASSA ABLOY Group company: www.emtek.com.
 - 1. Model: Contemporary Collection Modern Brass Keypad Entryset.
 - 2. Lever, Trim: Helios
 - 3. Finish: US 10B - Oil Rubbed Bronze.
- B. Passage / Privacy Sets, Deadbolt and Auxiliary Locks: Emtek®: an ASSA ABLOY Group company: www.emtek.com.
 - 1. Model / Style: Contemporary Collection
 - 2. Lever / Trim: Helios with Brass Modern Rectangular Rosette.
 - 3. Finish: US 10B - Oil Rubbed Bronze.
- C. Trim Levers and Knobs: Emtek®: an ASSA ABLOY Group company
- D. Hinges: www.hagerco.com.
 - 1. Type / Material: Full mortise / Solid Brass
 - 2. Finish: US 10B - Oil Rubbed Bronze
- E. Exit Devices and Closers: HAGER Companies: www.hagerco.com
 - 1. Exit Device Type / Material: 4600 Series Narrow Stile CVR LBR / Aluminum Trim - Dark Bronze
 - 2. Closer Type / Material: 5000 Series / Aluminum Cover - Dark Bronze.
- F. Thresholds: Dark Bronze Extruded Aluminum.
- G. Door Protection: Dark Bronze Brushed Aluminum
 - 1. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DOOR HARDWARE - GENERAL

- A. Provide hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.
- B. Provide items of a single type of the same model by the same manufacturer.

- C. Provide products that comply with the following:
 - 1. Applicable provisions of federal, state, and local codes.
 - 2. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
 - 3. Applicable provisions of NFPA 101, Life Safety Code.
 - 4. Fire-Rated Doors: NFPA 80.
 - 5. Hardware on Fire-Rated Doors, Except Hinges: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.
 - 6. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide hardware that enables door assembly to comply with air leakage requirements of the applicable code.
 - 7. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.
- D. Function: Lock and latch function numbers and descriptions of manufactures series as listed in hardware schedule.
- E. Finishes: Provide door hardware of the same finish unless otherwise indicated.
 - 1. Primary Finish: US 10B Oil Rubbed Bronze.
 - 2. Finish Definitions: BHMA A156.18.
 - 3. Exceptions:
 - a. Where base metal is specified to be different, provide finish that is an appearance equivalent according to BHMA A156.18.
 - b. Hinges for Fire-Rated Doors: Steel base metal with painted finish.
 - c. Door Closer Covers and Arms: Color to be selected by The Architect from manufacturer's standard colors.
 - d. Aluminum Surface Trim and Gasket Housings: Anodized to match door, not to match other hardware.
 - e. Hardware for Aluminum Storefront Doors: Finished to match door, except hand contact surfaces to be satin stainless steel.

2.03 LOCKS AND LATCHES

- A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.
 - 1. If no hardware set is indicated for a swinging door provide an office lockset.
 - 2. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.
 - 3. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.
- B. Lock Cylinders: Manufacturer's standard tumbler type, six-pin standard core.
 - 1. Provide cams and/or tailpieces as required for locking devices required.
- C. Keying: Grand master keyed.
- D. Latches: Provide a latch for every door that is not required to lock, unless specifically indicated "push/pull" or "not required to latch".

2.04 HINGES

- A. Hinges: Provide hinges on every swinging door.
 - 1. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
 - 2. Provide ball-bearing hinges at all doors having closers.
 - 3. Provide hinges in the quantities indicated.
 - 4. Provide non-removable pins on exterior outswinging doors.
 - 5. Where electrified hardware is mounted in door leaf, provide power transfer hinges.
- B. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7; standard weight, unless otherwise indicated.
- C. Quantity of Hinges Per Door:
 - 1. Doors From 60 inches High up to 90 inches High: Three hinges.
 - 2. Doors 90 inches High up to 120 inches High: Four hinges.

2.05 LOCKS AND LATCHES

- A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.

1. Hardware Sets indicate locking functions required for each door.
 2. If no hardware set is indicated for a swinging door provide an office lockset.
 3. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.
 4. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.
 5. In door sections, where a lock cylinder referenced to Section 08 7100 is specified, furnish and install a mortise lock cylinder keyed to the building keying system.
- B. Electrically Operated Locks: Fail secure unless otherwise indicated.
- C. Lock Cylinders: Manufacturer's standard tumbler type, six-pin standard core.
- D. Keying: Grand master keyed.
1. Include construction keying.
- E. Latches: Provide a latch for every door that is not required to lock, unless specifically indicated "push/pull" or "not required to latch".
1. Roller Latches:

2.06 CYLINDRICAL LOCKSETS

- A. Cylindrical Locks:
- B. Locking Functions: As defined in BHMA A156.2, and as follows.
1. Passage: No locking, always free entry and exit.
 2. Privacy: F76, emergency tool unlocks.
 3. Office: F81, key not required to lock, remains locked upon exit.
 4. Classroom: F84, key required to lock.
 5. Intruder Classroom: F110, keyed both sides.
 6. Always-Locked: F86, key required to lock, may not be left unlocked.
 7. Two-Key Entry: F88, outside locked by key from both sides, free egress
 8. Store Door: F91, locked by key from both sides, not an emergency exit (must be unlocked during occupied hours).
 9. Exit Only: F89, may not be left unlocked.

2.07 AUXILIARY LOCKS (DEADBOLTS)

- A. Locking Functions: As defined in BHMA A156.5, and as follows:
1. Deadbolt, Classroom: E017.
 2. Public Entry/Exit ("Nightlatch"): E023, D012
 3. Deadbolt, Unoccupied: E015 or F17, deadbolt by key outside and turn inside.
 4. Deadbolt, Classroom, Unoccupied: E010 or F18, deadbolt by key outside.

2.08 FLUSHBOLTS AND COORDINATORS

- A. Flushbolts: Lever extension bolts in leading edge of door, one bolt into floor, one bolt into top of frame.
1. Pairs of Swing Doors: At inactive leaves, provide flush bolts of type as required to comply with code.
 2. Floor Bolts: Provide dustproof strike except at metal thresholds.
- B. Manual Flushbolts: Provide lever extensions for top bolt at over-size doors.
- C. Self-Latching Flushbolts: Automatically latch upon closing of door; manually retracted.
- D. Automatic Flushbolts: Automatically latch upon closing of door; automatic retraction of bolts when active leaf is opened.

2.09 EXIT DEVICES

- A. Exit Devices:
- B. Locking Functions: Functions as defined in BHMA A156.3, and as follows:
1. Entry/Exit, Always-Unlocked: Outside lever unlocked, no outside key access, no latch holdback.
 2. Entry/Exit, Free Swing: Key outside retracts latch, latch holdback (dogging) for free swing during occupied hours, not fire-rated; outside trim must be specified as lever or pull.

3. Entry/Exit, Always-Latched: Key outside locks and unlocks lever, no latch holdback (dogging).
4. Entry/Exit, Always-Locked: Key outside retracts latchbolt but does not unlock lever, no latch holdback.
5. Exit Only, Secure: No outside trim, no key entry, no latch holdback, deadlocking latchbolt.

2.10 CLOSERS

- A. Closers:
- B. Closers: Complying with BHMA A156.4.
 1. Provide surface-mounted, door-mounted closers unless otherwise indicated.
 2. Provide a door closer on every exterior door.
 3. Provide a door closer on every fire- and smoke-rated door. Spring hinges are not an acceptable self-closing device unless specifically so indicated.
 4. On pairs of swinging doors, if an overlapping astragal is present, provide coordinator to ensure the leaves close in proper order.
 5. At corridors, locate door-mounted closer on room side of door.
 6. At outswinging exterior doors, mount closer in inside of door.

2.11 GASKETING AND THRESHOLDS

- A. Manual Bolts:
- B. Gasketing:
- C. Gaskets: Complying with BHMA A156.22.
 1. On each door in smoke partition, provide smoke gaskets; top, sides, and meeting stile of pairs. If fire/smoke partitions are not indicated on drawings, provide smoke gaskets on each door identified as a "smoke door" and 20-minute rated fire doors.
 2. On each exterior door, provide weatherstripping gaskets, unless otherwise indicated; top, sides, and meeting stiles of pairs.
 - a. Where exterior door is also required to have fire or smoke rating, provide gaskets functioning as both smoke and weather seals.
 3. On each exterior door, provide door bottom sweep, unless otherwise indicated.
- D. Thresholds: Complying with BHMA A156.21.
 1. At each exterior door, provide a threshold unless otherwise indicated.

2.12 KEY CABINET

- A. Cabinet Construction: Sheet steel construction, piano hinged door with cylinder type lock master keyed to building system.
- B. Cabinet Size: Size for project keys plus 10 percent growth.
- C. Hooks for Project keys.
- D. Horizontal metal strips for key hook labelling with clear plastic strip cover over labels.
- E. Finish: Baked enamel, color as selected.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.
- B. Verify that electric power is available to power operated devices and of the correct characteristics.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Use templates provided by hardware item manufacturer.
- C. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.
- D. Mounting heights for hardware from finished floor to center line of hardware item.

1. For steel doors and frames: Comply with DHI (LOCS) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames".
 2. For Wood Doors: Comply with DHI WDHS.3 "Recommended Locations for Architectural Hardware for Flush Wood Doors".
 3. Wood Doors: Refer to Section 08 1416.
- E. Set exterior door thresholds with full-width bead of elastomeric sealant on each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.03 FIELD QUALITY CONTROL

- A. Provide an Architectural Hardware Consultant to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.04 ADJUSTING

- A. Adjust work under provisions of Section 01 7000 - Execution and Closeout Requirements.
- B. Adjust hardware for smooth operation.
- C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.05 CLEANING

3.06 PROTECTION

- A. Protect finished Work under provisions of Section 01 7000 - Execution and Closeout Requirements.
- B. Do not permit adjacent work to damage hardware or finish.

3.07 SCHEDULE - Coordinate with door Schedule on Drawings

HARDWARE SETS

4.01 HARDWARE SETS - GENERAL

- A. These Hardware Sets indicate requirements for single doors of the types shown on the drawings, with conditional requirements for pairs and other situations.
- B. Pairs of Swinging Doors: Provide one of each specified item on each leaf unless specifically stated otherwise. Treat pairs as two active leaves unless otherwise indicated.

4.02 SWING DOORS : Note - Coordinate hardware to be included with manufactured, prehung assemblies

- A. HW-1: Exterior Entrance Door(s) Each opening to have:
1. Ball Bearing FM Hinges : (See Part 2 for Quantities) US 10B.
 2. Electronic, Keypad Entrance Lockset - Pull with Thumbatch, exterior side, Lever and thumbturn interior side US 10B
 3. Closer. Dark Bronze
 4. Threshold and Full Weather Stripping
- B. HW-2: Passage Latchset, Non-Fire-Rated.
1. FM Hinges:(See Part 2 for quantities.) US 10B
 2. Latchset, Passage. Lever trim with Modern Rectangular Rosettes. US 10B
 3. Pair: One leaf inactive, with manual flush bolts. US 10B
- C. HW-3: Privacy Latchset with Auxiliary Deadbolt Lock. :
1. FM Hinges (See part 2 for Quantities) US 10B.
 2. Privacy Latchset with Lever Trim and Modern Rectangular Rosettes, US 10B Finish.
 3. Auxiliary Deadbolt Lock with thumbturn interior side - Brass Square Style US 10B Finish.

END OF SECTION

SECTION 08 8000**GLAZING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Glass.
- B. Glazing compounds and accessories.

1.02 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
- B. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2011).
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- D. ASTM C1036 - Standard Specification for Flat Glass; 2011.
- E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- F. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.
- G. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.
- H. ASTM E 773 - Standard Test Method for Accelerated Weathering of Sealed Insulating Glass Units; 2001.
- I. ASTM E 774 - Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units; 1997.
- J. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.
- K. GANA (GM) - GANA Glazing Manual; 2009.
- L. GANA (SM) - GANA Sealant Manual; 2008.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
- C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
- D. Samples: Submit two samples 12X12 inch in size of glass and plastic units, showing coloration and design.
- E. Certificates: Certify that products meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

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

1.05 PRE-INSTALLATION MEETING

- A. Convene one week before starting work of this section.

1.06 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 50 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Sealed Insulating Glass Units: Provide a five (5) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

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

1.08 MAINTENANCE PRODUCTS

PART 2 PRODUCTS

2.01 INSULATING GLASS UNITS

2.02 GLASS MATERIALS

- A. Float Glass Manufacturers:
 1. ACH Glass/Versalux: www.versaluxglass.com.
 2. AGC Flat Glass North America, Inc: www.afgglass.com.
 3. Pilkington North America Inc: www.pilkington.com/na.
 4. PPG Industries, Inc: www.ppgideascales.com.
 5. Substitutions: Refer to Section 01 6000 - Product Requirements.
- B. Float Glass: Provide float glass based glazing unless noted otherwise.
 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality-Q3.
 2. Heat-Strengthened and Fully Tempered Types: ASTM C1048, Kind HS and Kind FT.
 3. Tinted Types: ASTM C1036, Class 2 - Tinted, color and performance characteristics as indicated.
 4. Thicknesses: As indicated; for exterior glazing comply with requirements indicated for wind load design regardless of thickness indicated.
- C. Clear Float Glass (Type G-1): Clear, annealed.
 1. Comply with ASTM C 1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
 2. Comply with ASTM C 1048.
 3. 6 mm minimum thick.
- D. Safety Glass (Type G-2): Clear; heat strengthened.
 1. Laminated with 0.060 inch thick plastic interlayer; comply with ASTM C 1172
 2. Comply with 16 CFR 1201 test requirements for Category II.
 3. 6 mm minimum thick.
- E. Tinted Glass (Type G-3): Float type, heat strengthened, Gray color.
 1. Light transmittance of 75 percent, shading coefficient of 0.69.
 2. Comply with ASTM C 1036, Type I, transparent flat, Class 2, Quality Q3 (glazing select).
 3. Comply with ASTM C 1048.
 4. 6 mm minimum thick.
- F. Low E Glass (Type G-4): Float type, heat strengthened, clear.
 1. Coating on inner surface.
 2. Visible light transmittance of 80 percent, solar light transmittance of 60 percent, shading coefficient of 0.69.
 3. Comply with ASTM C 1036, Type I, transparent flat, Quality Q3 (glazing select).
 4. 6 mm minimum thick.

2.03 SEALED INSULATING GLASS UNITS

- A. Manufacturers:
 1. Any of the manufacturers specified for float glass.
 2. Substitutions: Refer to Section 01 6000 - Product Requirements.
- B. Sealed Insulating Glass Units: Types as indicated.
 1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 2. Edge Spacers: Aluminum, bent and soldered corners.
 3. Edge Seal: Glass to elastomer with supplementary silicone sealant.
 4. Purge interpane space with dry hermetic air.
- C. Insulating Glass Units (Type IG-1): Double pane with glass to mastic edge seal.
 1. Outer pane of G-3 glass, inner pane of G-4 glass.
 2. Place low E coating on No.2 surface within the unit.

3. Durability: Certified by an independent testing agency to comply with ASTM E 2190.
4. Comply with ASTM E 774 and E 773, Class CBA.
5. Purge interpane space with dry hermetic air.
6. Total unit thickness of 1/2 inch minimum.

D. Edge Seal Construction: Aluminum, mitered and spigoted corners.

2.04 GLAZING COMPOUNDS

- A. Manufacturers:
1. Bostik Inc: www.bostik-us.com.
 2. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com.
 3. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.
 4. Substitutions: Refer to Section 01 6000 - Product Requirements.
- B. Glazing Putty, Type ____: Polymer modified latex recommended by manufacturer for outdoor use, knife grade consistency; grey color.
- C. Butyl Sealant, Type ____: Single component; ASTM C920, Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.
- D. Silicone Sealant, Type ____: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; _____ color.

2.05 GLAZING ACCESSORIES

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.
- C. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; _____.
- D. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

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

3.03 INSTALLATION - EXTERIOR/INTERIOR DRY METHOD (GASKET GLAZING)

- A. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- B. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- C. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.04 INSTALLATION - EXTERIOR DRY METHOD (TAPE AND GASKET SPLINE GLAZING)

- A. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
- D. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
- E. Trim protruding tape edge.

3.05 INSTALLATION - EXTERIOR WET METHOD (SEALANT AND SEALANT)

- A. Place setting blocks at 1/4 points and install glazing pane or unit.
- B. Install removable stops with glazing centered in space by inserting spacer shims both sides at 24 inch intervals, 1/4 inch below sight line.
- C. Fill gaps between glazing and stops with Silicone type sealant to depth of bite on glazing, but not more than 3/8 inch below sight line to ensure full contact with glazing and continue the air and vapor seal.
- D. Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.06 FIELD QUALITY CONTROL

- A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- B. Monitor and report installation procedures and unacceptable conditions.

3.07 CLEANING

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

3.08 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

3.09 SCHEDULE See Drawings**END OF SECTION**

SECTION 08 8300**MIRRORS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Glass mirrors.
 - 1. Annealed float glass.
 - 2. Tempered safety glass.

1.02 REFERENCE STANDARDS

- A. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- C. ASTM C1036 - Standard Specification for Flat Glass; 2011.
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.
- E. GANA (GM) - GANA Glazing Manual; 2009.
- F. GANA (SM) - GANA Sealant Manual; 2008.
- G. GANA (TIPS) - Mirrors: Handle with Extreme Care (Tips for the Professional on the Care and Handling of Mirrors); 2011.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds: Submit chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Manufacturer's Certificate: Certify that mirrors, meets or exceeds specified requirements.
- E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in The Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM) and GANA (SM) for glazing installation methods.

1.05 FIELD CONDITIONS

- A. Do not install mirrors when ambient temperature is less than 50 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Mirrors:
 - 1. Trulite Glass and Aluminum Solutions; _____: www.trulite.com.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

- A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.
- B. Mirror Glass: Clear, annealed float glass; ASTM C1036, with copper and silver coatings, and protective overcoating.
 - 1. Thickness: 3/32 inch.

2. Edges: Square and lapped.
3. Size: As noted on drawings.

2.03 GLAZING COMPOUNDS

- A. Acrylic Sealant: ASTM C920, Type S, Grade NS, Class 12-1/2, Uses M and A; single component, solvent curing, non-bleeding; cured Shore A hardness of 15 to 25; clear color.
- B. Silicone Sealant: ASTM C920, Type S, Grade NS, Class 25, Uses M and A; single component; chemical or solvent curing; non-bleeding, non-staining, cured Shore A hardness of 15 to 25; _____ color.

2.04 ACCESSORIES

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness.
- B. Glazing Tape: Preformed butyl compound; 10 to 15 Shore A durometer hardness; on release paper.
- C. Glazing Clips: Manufacturer's standard type.
- D. Mirror Attachment Accessories: Stainless steel clips.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings for mirrored glazing are correctly sized and within tolerance.
- B. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

3.02 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.

3.03 INSTALLATION

- A. Install mirrors in accordance with GANA (TIPS) and manufacturers recommendations.
- B. Set mirrors plumb and level, and free of optical distortion.
- C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.
- D. Frameless Mirrors: Set mirrors in proper place with adhesive, applied in accordance with adhesive manufacturer's instructions.

3.04 CLEANING

- A. Remove wet glazing materials from finish surfaces.
- B. Clean mirrors and adjacent surfaces.

3.05 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste.

END OF SECTION

SECTION 08 8300**MIRRORS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Glass mirrors.
 - 1. Annealed float glass.
 - 2. Tempered safety glass.

1.02 REFERENCE STANDARDS

- A. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- C. ASTM C1036 - Standard Specification for Flat Glass; 2011.
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.
- E. GANA (GM) - GANA Glazing Manual; 2009.
- F. GANA (SM) - GANA Sealant Manual; 2008.
- G. GANA (TIPS) - Mirrors: Handle with Extreme Care (Tips for the Professional on the Care and Handling of Mirrors); 2011.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds: Submit chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Manufacturer's Certificate: Certify that mirrors, meets or exceeds specified requirements.
- E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in The Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM) and GANA (SM) for glazing installation methods.

1.05 FIELD CONDITIONS

- A. Do not install mirrors when ambient temperature is less than 50 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Mirrors:
 - 1. Trulite Glass and Aluminum Solutions; _____: www.trulite.com.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

- A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.
- B. Mirror Glass: Clear, annealed float glass; ASTM C1036, with copper and silver coatings, and protective overcoating.
 - 1. Thickness: 3/32 inch.

2. Edges: Square and lapped.
3. Size: As noted on drawings.

2.03 GLAZING COMPOUNDS

- A. Acrylic Sealant: ASTM C920, Type S, Grade NS, Class 12-1/2, Uses M and A; single component, solvent curing, non-bleeding; cured Shore A hardness of 15 to 25; clear color.
- B. Silicone Sealant: ASTM C920, Type S, Grade NS, Class 25, Uses M and A; single component; chemical or solvent curing; non-bleeding, non-staining, cured Shore A hardness of 15 to 25; _____ color.

2.04 ACCESSORIES

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness.
- B. Glazing Tape: Preformed butyl compound; 10 to 15 Shore A durometer hardness; on release paper.
- C. Glazing Clips: Manufacturer's standard type.
- D. Mirror Attachment Accessories: Stainless steel clips.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings for mirrored glazing are correctly sized and within tolerance.
- B. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

3.02 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.

3.03 INSTALLATION

- A. Install mirrors in accordance with GANA (TIPS) and manufacturers recommendations.
- B. Set mirrors plumb and level, and free of optical distortion.
- C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.
- D. Frameless Mirrors: Set mirrors in proper place with adhesive, applied in accordance with adhesive manufacturer's instructions.

3.04 CLEANING

- A. Remove wet glazing materials from finish surfaces.
- B. Clean mirrors and adjacent surfaces.

3.05 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste.

END OF SECTION

SECTION 08 8300**MIRRORS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Glass mirrors.
 - 1. Annealed float glass.
 - 2. Tempered safety glass.

1.02 REFERENCE STANDARDS

- A. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- C. ASTM C1036 - Standard Specification for Flat Glass; 2011.
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.
- E. GANA (GM) - GANA Glazing Manual; 2009.
- F. GANA (SM) - GANA Sealant Manual; 2008.
- G. GANA (TIPS) - Mirrors: Handle with Extreme Care (Tips for the Professional on the Care and Handling of Mirrors); 2011.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds: Submit chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Manufacturer's Certificate: Certify that mirrors, meets or exceeds specified requirements.
- E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in The Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM) and GANA (SM) for glazing installation methods.

1.05 FIELD CONDITIONS

- A. Do not install mirrors when ambient temperature is less than 50 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Mirrors:
 - 1. Trulite Glass and Aluminum Solutions; _____: www.trulite.com.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

- A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.
- B. Mirror Glass: Clear, annealed float glass; ASTM C1036, with copper and silver coatings, and protective overcoating.
 - 1. Thickness: 3/32 inch.

2. Edges: Square and lapped.
3. Size: As noted on drawings.

2.03 GLAZING COMPOUNDS

- A. Acrylic Sealant: ASTM C920, Type S, Grade NS, Class 12-1/2, Uses M and A; single component, solvent curing, non-bleeding; cured Shore A hardness of 15 to 25; clear color.
- B. Silicone Sealant: ASTM C920, Type S, Grade NS, Class 25, Uses M and A; single component; chemical or solvent curing; non-bleeding, non-staining, cured Shore A hardness of 15 to 25; _____ color.

2.04 ACCESSORIES

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness.
- B. Glazing Tape: Preformed butyl compound; 10 to 15 Shore A durometer hardness; on release paper.
- C. Glazing Clips: Manufacturer's standard type.
- D. Mirror Attachment Accessories: Stainless steel clips.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings for mirrored glazing are correctly sized and within tolerance.
- B. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

3.02 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.

3.03 INSTALLATION

- A. Install mirrors in accordance with GANA (TIPS) and manufacturers recommendations.
- B. Set mirrors plumb and level, and free of optical distortion.
- C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.
- D. Frameless Mirrors: Set mirrors in proper place with adhesive, applied in accordance with adhesive manufacturer's instructions.

3.04 CLEANING

- A. Remove wet glazing materials from finish surfaces.
- B. Clean mirrors and adjacent surfaces.

3.05 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste.

END OF SECTION

SECTION 09 6433**ENGINEERED WOOD FLOORING SYSTEMS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Engineered wood flooring.
- B. Installation accessories.

1.02 RELATED REQUIREMENTS

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06 1000 - Rough Carpentry: Wood based subfloor surface.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2014c.
- C. ASTM F970 - Standard Test Method for Static Load Limit; 2007 (Reapproved 2011).
- D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.
- E. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, wood species and colors available; and installation instructions.
- C. Shop Drawings: Indicate floor joint pattern and termination details.
- D. Samples: Submit two assembled, finished samples 12 by 12 inches square installed on subfloor material, or accurate facsimile of subfloor layer, e.g. 3/4 inch thick cement board in lieu of concrete., illustrating floor system assembly, material attachment and accessories surface finish, color, and sheen.
- E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section.
 - 1. Approved by manufacturer.

1.06 FIELD CONDITIONS

- A. Do not install floor system until wet construction work is complete and ambient air at installation space has moisture content stabilized at maximum moisture content of 40 percent.
- B. Provide heat, light, and ventilation prior to installation.
- C. Store materials in area of installation for minimum period of 72 hours prior to installation.
- D. Maintain minimum room temperature of 65 degrees F and relative humidity in accordance with adhesive manufacturer's instructions for a minimum period of 48 hours prior to delivery of materials to installation space, during installation, and after installation.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Engineered Wood Flooring System:
 - 1. US Floors Product : Engineered Locking Strand Woven Bamboo with HDF Core: www.usfloors.com.
 - 2. Substitutions: Don't even think about it without complete compliance with Section 01 6000 - Product Requirements.

2.02 MATERIALS

- A. Engineered Wood Flooring: Engineered Locking Strand Woven Bamboo on HDF:
 - 1. Species: Moso6® Premium 6-Year Mature Moso Bamboo
 - a. Construction: Tongue and groove, with micro-beveled edge, self-locking, 3-ply engineered wood planks.
 - 2. Installation Method: US Floors, "Drop & Lock Glueless Floating floor installation".
 - 3. Static Load Resistance: 250 psi minimum, when tested in accordance with ASTM F970.
 - 4. Color: As selected from manufacturer's full range for species specified above.
 - 5. Thickness: 1/2 inch.
 - 6. Face Width: 5 1/4 inch.
 - 7. Edge Profile: micro beveled.
 - 8. Length: 72 inches.
 - 9. Treatment: Endura AR+® Commercial wear layer, plank backs, T&G edges sealed.
 - 10. Finish: Factory applied, UV cured urethane.

2.03 ACCESSORIES

- A. Vapor retarding base layer: Moisture resistant backed kraft building paper.
- B. Transition Strip: Same species and finish as flooring material; profiles indicated.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that sub-floor surfaces are smooth and flat within the tolerances required for type of substrate and ready to receive laminated wood flooring.
- B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of materials to substrate surface.
- C. Verify that wood sub-floors have 12 percent or less moisture content.
- D. Verify that concrete sub-floor surfaces are ready for wood flooring installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are outside the limits recommended by adhesive materials manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Prepare sub-floor in accordance with flooring manufacturer's installation instructions.
- B. Vacuum clean substrate.

3.03 INSTALLATION

- A. Vapor Retarder: Install loose laid, seams overlapped 4 inches and sealed with polyethylene tape. Run material 2 inches up the wall and trim after flooring is installed.
- B. Wood Flooring:
 - 1. Install flooring in accordance with manufacturer's installation instructions.
 - 2. Lay flooring in patterns indicated on drawings. Verify alignment as work progresses.
 - 3. Arrange flooring with end matched grain set flush and tight.
 - 4. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar; provide divider strips and transition strips in accordance with flooring manufacturer's recommendations and as indicated.
 - 5. Install edge strips at unprotected or exposed edges, and where flooring terminates.

6. Secure edge strips before installation of flooring with stainless steel screws.
7. Install flooring tight to floor access covers.
8. Install flooring under movable partitions without interrupting floor pattern.
9. Provide 1/2 inch expansion space at fixed walls and other interruptions.
10. Within two (2) hours of adhesive applied flooring installation, roll work thoroughly in both directions with 100 lb roller.

3.04 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damaging surfaces.
- B. Clean floor surfaces in accordance with the flooring manufacturer's instructions.

3.05 PROTECTION

- A. Prohibit traffic on finished floor for 48 hours after installation.
- B. Place durable, protective coverings over traffic areas of finished floors and do not permit foot traffic over unprotected floor areas without removing footwear first. Do not remove coverings until after Date of Substantial Completion.

END OF SECTION

SECTION 09 6813**TILE CARPETING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Carpet tile, fully adhered.
- B. Removal of existing carpet material and other floor covering..

1.02 RELATED REQUIREMENTS

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 7419 - Construction Waste Management and Disposal: Reclamation/Recycling of new carpet tile scrap, removed carpet tile, and broad loom carpet.
- C. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.
- D. Section 03 5400 - Cast Underlayment.
- E. Section 09 0561 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Section 01 2100 - Allowances: Cash allowances if applicable affecting this section.

1.04 REFERENCE STANDARDS

- A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2006 (Reapproved 2011).
- B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2014c.
- C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.
- D. CRI (GLA) - Green Label Testing Program - Approved Adhesive Products; Carpet and Rug Institute; Current Edition.
- E. CRI (GLC) - Green Label Testing Program - Approved Product Categories for Carpet; Carpet and Rug Institute; Current Edition.
- F. CRI (GLP) - Green Label Plus Testing Program - Certified Products; www.carpet-rug.org; current edition.
- G. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- D. Manufacturer's Installation Instructions: Indicate special procedures.
- E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- F. Dry mockups: G.C. to provide "dry" mockups of two areas indicated on finish plans for architect's review and approval prior to adhering carpet tiles.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.07 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. BASIS OF DESIGN: Interface, Inc. www.interfaceinc.com; Product See Paragraph 2.02.
- B. Other Acceptable Manufacturers: Subject to Compliance with Requirements
 - 1. Alternate Manufacturer must be able to provide a Custom Strike-Off as an acceptable facsimile of the Basis of Design Product.
 - a. Bentley Prince Street; ____: www.bentleymills.com.
 - b. Shaw Contract Group: www.shawcontractgroup.com.
 - c. Substitutions: Not permitted.

2.02 MATERIALS

- A. Carpet Tile Type CPT-1: Tufted tip-sheared, manufactured in one color dye lot.
 - 1. Product: Interface Flor Human Nature™ Collection Series: HN830™ OR HN840™ shown on the Drawings: www.interfaceflor.com.
 - 2. Tile Size: Modular, 25cm x 1m inch, nomina : Confirm with Finish Schedule.
 - 3. Pile Thickness: 0.071 inch.
 - 4. Pile Density: 9,127 oz/yd²
 - 5. Color and Pattern : See Finish Schedule.
 - 6. Backing: Glas Bac tile.
 - 7. Yarn: Agnafil, 100% recycled content Type 6 Nylon, 100% Solution Dyed.
 - 8. Install: See Finish Plan
 - 9. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 - 10. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
 - 11. VOC Content: Provide CRI (GLP) certified product; in lieu of labeling, independent test report showing compliance is acceptable.
 - 12. VOC Content: Provide CRI Green Label certified product; in lieu of labeling, independent test report showing compliance is acceptable.

2.03 ACCESSORIES

- A. Sub-Floor Filler: White premix latex; type recommended by flooring material manufacturer.
- B. Adhesives: Acceptable to carpet tile manufacturer, compatible with materials being adhered; maximum VOC of 50 g/L; CRI Green Label certified; in lieu of labeled product, independent test report showing compliance is acceptable.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet tile.
- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.
- D. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and pH.
 - 1. Test in accordance with Section 09 0561.
- E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Prepare floor substrates for installation of flooring in accordance with Section 09 0561.

- B. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with floor leveling underlayment.
- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- D. Vacuum clean substrate.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions.
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.
- F. Locate change of color or pattern between rooms under door centerline.
- G. Fully adhere carpet tile to substrate.
- H. Trim carpet tile neatly at walls and around interruptions.
- I. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 9000**PAINTING AND COATING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints and other coatings.
- C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 2. Exposed surfaces of steel lintels and ledge angles.
 - 3. Unfinished surfaces inside cabinets.
 - 4. Prime surfaces to receive wall coverings.
 - 5. Interior walls and bottom of swimming pools and fountains.
 - 6. Mechanical and Electrical:
 - a. In finished areas, paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
 - b. In finished areas, paint shop-primed items.
 - c. On the roof and outdoors, paint all equipment that is exposed to weather or to view, including that which is factory-finished.
 - d. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat dark gray paint to visible surfaces.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Non-metallic roofing and flashing.
 - 6. Floors, unless specifically so indicated.
 - 7. Glass.
 - 8. Concealed pipes, ducts, and conduits.
- E. Painting materials and methods for conduit identification specified in Section 26 0553.
- F. See Schedule - Surfaces to be Finished, at end of Section.

1.02 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2014.
- C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 2007.
- D. GreenSeal GS-11 - Paints and Coatings; 2013.
- E. NACE (IMP) - Industrial Maintenance Painting; NACE International; Edition date unknown.
- F. SSPC (PM1) - Good Painting Practice: SSPC Painting Manual, Vol. 1; Society for Protective Coatings; Fourth Edition.

1.03 DEFINITIONS

- A. Conform to ASTM D 16 for interpretation of terms used in this section.

1.04 SUBMITTALS

- A. Product Data: Provide complete list of all products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
- B. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, submit each color in each sheen available.
- C. Product Data: Provide data on all finishing products, including VOC content.
- D. Samples: Submit two samples, on gypsum board, or chip paper 12 x 12 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.
- E. Certification: By manufacturer that all paints and coatings comply with VOC limits specified.
- F. Certification: By manufacturer that all paints and coatings do not contain any of the prohibited chemicals specified; GreenSeal GS-11 certification is not required but if provided shall constitute acceptable certification.
- G. Manufacturer's Instructions: Indicate special surface preparation procedures.
- H. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum fifteen years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience.

1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable code for flame and smoke rating requirements for products and finishes.

1.07 MOCK-UP

- A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.
- B. Provide panel, eight feet (three m) long by eight feet wide, illustrating special coating color, texture, and finish.
- C. Provide door and frame assembly illustrating paint coating color, texture, and finish.
- D. Locate where directed.
- E. Mock-up may remain as part of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.09 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

- D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
- F. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

1.10 EXTRA MATERIALS

- A. See Section 01 6000 - Product Requirements, for additional provisions.
- B. Supply 10 gallons of each color; store where directed.
- C. Label each container with color in addition to the manufacturer's label.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.
- B. Provide all paint and coating products from the same manufacturer to the greatest extent possible.
- C. Paints:
 - 1. Glidden Professional, a product of PPG Architectural Coatings: www.gliddenprofessional.com.
 - 2. Benjamin Moore & Co: www.benjaminmoore.com.
 - 3. PPG Architectural Finishes, Inc: www.ppgaf.com.
 - 4. Sherwin Williams Company: www.sherwinwilliams.com.
- D. Transparent Finishes:
 - 1. Base Manufacturer: Benjamin Moore & Co: www.benjaminmoore.com..
- E. Stains:
 - 1. Base Manufacturer: Benjamin Moore & Co: www.benjaminmoore.com..
- F. Primer Sealers: Same manufacturer as top coats.
 - 1. Benjamin Moore & Co: www.benjaminmoore.com.
 - 2. ICI Paints North America: www.icipaintsinna.com
 - 3. PPG Architectural Finishes, Inc: www.ppgaf.com.
 - 4. Sherwin Williams Company: www.sherwinwilliams.com
- G. Block Fillers: Same manufacturer as top coats.
 - 1. Benjamin Moore & Co: www.benjaminmoore.com..
 - 2. ICI Paints North America: www.icipaintsinna.com.
 - 3. PPG Architectural Finishes, Inc: www.ppgaf.com.
 - 4. Sherwin Williams Company: www.sherwinwilliams.com
- H. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PAINTS AND COATINGS - GENERAL

- A. Provide paints and coatings from Manufacturers' "Residential" Quality lines, or better. "Builder" Quality material is not acceptable and will not be considered for use.
- B. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
 - 1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Supply each coating material in quantity required to complete entire project's work from a single production run.
 - 3. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

- C. Primers: As follows unless other primer is required or recommended by manufacturer of top coats; where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
- D. Volatile Organic Compound (VOC) Content:
 - 1. Provide coatings that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. Ozone Transport Commission (OTC) Model Rule, Architectural, Industrial, and Maintenance Coatings; www.otcair.org; specifically:
 - 1) Opaque, Flat: 50 g/L, maximum.
 - 2) Opaque, Nonflat: 150 g/L, maximum.
 - 3) Opaque, High Gloss: 250 g/L, maximum.
 - c. Architectural coatings VOC limits of Most current Federal Standard.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- E. Chemical Content: The following compounds are prohibited:
 - 1. Aromatic Compounds: In excess of 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
 - 2. Acrolein, acrylonitrile, antimony, benzene, butyl benzyl phthalate, cadmium, di (2-ethylhexyl) phthalate, di-n-butyl phthalate, di-n-octyl phthalate, 1,2-dichlorobenzene, diethyl phthalate, dimethyl phthalate, ethylbenzene, formaldehyde, hexavalent chromium, isophorone, lead, mercury, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride, naphthalene, toluene (methylbenzene), 1,1,1-trichloroethane, vinyl chloride.
- F. Colors: As indicated on drawings
 - 1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Provide Premium Grade systems (2 top coats) as defined in MPI Architectural Painting Specification Manual, except as otherwise indicated.
- B. Where a specified paint system does not have a Premium Grade, provide Custom Grade system.
- C. Where a specified paint system does not have a Custom Grade, provide Premium Grade system.
- D. Where sheen is not specified or more than one sheen is specified, sheen will be selected later by The Architect from the manufacturer's full line.
- E. Provide colors as scheduled on Drawings.
- F. Paint WE-OP-3L - Wood, items to be painted, Opaque, Latex, 3 Coat:
 - 1. One coat of latex primer sealer.
 - 2. Matte Gloss (eggshell): Two coats of latex enamel.
 - 3. Semi-gloss: Two coats of latex enamel.
- G. Paint WE-TR-S - Wood, Transparent, Sealer, Optional Stain:
 - 1. One coat of wipingstain; _____.
 - 2. Minimum Two coats of clear UV stabilized sealer; _____.
- H. Paint CE-OP-3A - Concrete/Masonry, Opaque, Alkyd, 3 Coat:
 - 1. One coat of block filler.
- I. Paint CE-OP-3L - Masonry/Concrete, Opaque, Latex, 3 Coat:
 - 1. 2 coats minimum Block Filler.
 - 2. Matte Gloss: Two Coats of Latex Enamel.
 - 3. Semi-gloss: Two coats of latex enamel.
 - 4. Matte Gloss: Two coats of latex enamel.

- J. Paint ME-OP-2A - Ferrous Metals, Primed, Alkyd, 2 Coat:
 1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
 2. Gloss: Two coats of alkyd enamel. BM M22
 3. Semi-gloss: Two coats of alkyd enamel.
- K. Paint ME-OP-2L - Ferrous Metals, Primed, Latex, 2 Coat:
 1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
 2. Gloss: Two coats of latex enamel; _____.
 3. Semi-gloss: Two coats of latex enamel; _____.
- L. Paint MgE-OP-3A - Galvanized Metals, Alkyd, 3 Coat:
 1. One coat galvanize primer. Acrylic
 2. Gloss: Two coats of alkyd enamel.
 3. Semi-gloss: Two coats of alkyd enamel.

2.04 PAINT SYSTEMS - INTERIOR

- A. Provide Premium Grade systems (2 top coats) as defined in MPI Architectural Painting Specification Manual, except as otherwise indicated.
- B. Where a specified paint system does not have a Premium Grade, provide Custom Grade system.
- C. Where a specified paint system does not have a Custom Grade, provide Premium Grade system.
- D. Where sheen is not specified or more than one sheen is specified, sheen will be selected later by The Architect from the manufacturer's full line.
- E. Provide colors as scheduled on Drawings.
- F. Paint WI-OP-3L - Wood, Opaque, Latex, 3 Coat:
 1. One coat of latex primer sealer.
 2. Gloss: Two coats of latex enamel.
 3. Semi-gloss: Two coats of latex enamel.
 4. Satin Gloss: Two coats of latex enamel.
 5. Flat: Two coats of latex enamel; Ceilings only UNO.
- G. Paint GI-OP-3L - Gypsum Board/Plaster, Latex, 3 Coat:
 1. One coat of Latex primer sealer.
 2. Semi-gloss: Two coats of latex enamel.
 3. Satin Gloss (eggshell): Two coats of latex enamel.
 4. Flat: Two coats of latex enamel; .
- H. Paint GI-OP-3LA - Gypsum Board/Plaster, Latex-Acrylic, 3 Coat:
 1. One coat of latex primer sealer.
 2. Semi-gloss: Two coats of latex-acrylic enamel.
 3. Satin Gloss (eggshell): Two coats of latex-acrylic enamel.

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex, non-shrink filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.

- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Gypsum Wallboard: 12 percent.
 - 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
 - 3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
 - 4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
 - 5. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to coating application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- H. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- I. Insulated Coverings to be Painted: Remove dirt, grease, and oil from canvas and cotton.
- J. Concrete Floors and Traffic Surfaces to be Painted: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- K. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- L. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-SP 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1 (solvent cleaning).
- M. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
- N. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
- O. Interior Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
- P. Interior Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.
- Q. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior caulking compound after prime coat has been applied. Back prime concealed surfaces before installation.

- R. Exterior Wood to Receive Transparent Finish: Remove dust, grit, and foreign matter; seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes with tinted exterior caulking compound after sealer has been applied. Prime concealed surfaces.
- S. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.
- T. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.
- C. Apply products in accordance with manufacturer's instructions. Do not tint primers.
- D. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- E. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- F. Apply each coat to uniform appearance.
- G. Sand wood and metal surfaces lightly between coats to achieve required finish.
- H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- I. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- J. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 SCHEDULE - SURFACES TO BE FINISHED- See Drawings

- A. Do Not Paint or Finish the Following Items:
 - 1. Items fully factory-finished unless specifically noted.
 - 2. Fire rating labels, equipment serial number and capacity labels.
 - 3. Stainless steel items.
- B. Mechanical and Electrical: Use paint systems defined for the substrates to be finished.
 - 1. Paint all insulated and exposed pipes occurring in finished areas to match background surfaces, unless otherwise indicated.
 - 2. Paint all equipment, including that which is factory-finished, exposed to weather or to view on the roof and outdoors.
 - 3. Paint shop-primed items occurring in finished areas.
 - 4. Paint interior surfaces of air ducts and convactor and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
 - 5. Paint dampers exposed behind louvers, grilles, and convactor and baseboard cabinets to match face panels.
- C. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

3.07 SCHEDULE - COLORS See Drawings

END OF SECTION

SECTION 10 2800**TOILET AND BATH ACCESSORIES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Accessories for utility, bath and toilet rooms and showers.
- B. Grab bars.

1.02 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
- B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015.
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- D. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2011.
- E. ASTM C1036 - Standard Specification for Flat Glass; 2011.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Toilet Accessories:
 - 1. Bobrick Toilet Accessories: www.bobrick.com.
 - 2. ASI - American Specialties, Inc; _____: www.americanspecialties.com.
 - 3. Bradley Corporation; _____: www.bradleycorp.com.
 - 4. Substitutions: Section 01 6000 - Product Requirements.
- B. All items of each type to be made by the same manufacturer as indicated Accessory Schedule on Finish Drawings

2.02 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
- B. Stainless Steel Sheet: ASTM A666, Type 304.
- C. Stainless Steel Tubing: ASTM A269/A269M, Type 304 or 316.
- D. Fasteners, Screws, and Bolts: Hot dip galvanized.

2.03 FINISHES

- A. Stainless Steel: No. 4 Brushed finish, unless otherwise noted.
- B. Chrome/Nickel Plating: ASTM B456, SC 2, satin finish, unless otherwise noted.
- C. Galvanizing for Items Other than Sheet: Comply with ASTM A123/A123M; galvanize ferrous metal and fastening devices.
- D. Back paint components where contact is made with building finishes to prevent electrolysis.

2.04 TOILET ROOM ACCESSORIES :

- A. Toilet Paper Dispenser: Single roll, surface mounted bracket type, stainless steel.

- B. Robe Hook: Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and backplate for concealed attachment, bright polished finish.

2.05 SHOWER AND TUB ACCESSORIES

- A. Towel Bar: Stainless steel Type 304, 3/4 inch square tubular bar; rectangular brackets, concealed attachment, satin finish.
- B. Robe Hook: Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and backplate for concealed attachment, bright polished finish.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. Verify that field measurements are as indicated on drawings.
- D. See Section 061000 - Rough Carpentry for installation of blocking, reinforcing plates, and concealed anchors in walls and ceilings.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on the drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights and Locations: as indicated on drawings

3.04 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 4400**FIRE EXTINGUISHERS AND ACCESSORIES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Fire extinguishers.
- B. Accessories.

1.02 REFERENCE STANDARDS

- A. NFPA 10 - Standard for Portable Fire Extinguishers; 2013.
- B. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.03 PERFORMANCE REQUIREMENTS

- A. Conform to NFPA 10.
- B. Provide extinguishers classified and labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.
- C. Product Data: Provide extinguisher operational features.
- D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Fire Extinguishers, and Accessories:
 - 1. JL Industries, Inc; _____: www.jlindustries.com.
 - 2. Larsen's Manufacturing Co; _____: www.larsensmfg.com.
 - 3. Potter-Roemer; _____: www.potterroemer.com.

2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
- B. Dry Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gage.
 - 1. Class 10 B:C.
 - 2. Size 2 1/2 lb..
 - 3. Finish: Baked enamel, Red color.

2.03 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, chrome-plated.
- B. Identification Decal with text "FIRE EXTINGUISHER" in red for application to kitchen cabinet door.

PART 3 EXECUTION**3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure rigidly in place.
- C. Place extinguishers in cabinets.

3.03 SCHEDULES

- A. Mounted on bracket inside sink base cabinet of each dwelling unit kitchen with identification decal placed on cabinet door.

END OF SECTION

SECTION 11 3100**RESIDENTIAL APPLIANCES AND FIXTURES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Kitchen appliances.
- B. Equipment.

1.02 REFERENCE STANDARDS

- A. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.
- C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in The Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

1.05 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.
- C. Provide ten (10) year manufacturer warranty on magnetron tube of microwave ovens.
- D. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

PART 2 PRODUCTS**2.01 KITCHEN APPLIANCES**

- A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.
- B. Refrigerator, Type REF: Free-standing, bottom-mounted freezer, and frost-free.
 - 1. Capacity: Total minimum storage of 27 cubic ft; minimum 40 percent freezer capacity.
 - 2. Features: Include glass shelves, automatic icemaker, and light in freezer compartment.
 - 3. Exterior Finish: Stainless steel.
 - 4. Manufacturers: Basis of Design:
 - a. Samsung Family Hub, 4-door: www.samsung.com.
- C. Range and Oven, RO: Electric, drop-in, with glass-ceramic cooktop.
 - 1. Size: 30 inches wide.
 - 2. Oven: Self-cleaning with electronic ignition.
 - 3. Elements: Four (4).
 - 4. Controls: Solid state electronic.
 - 5. Features: Include storage drawer, oven door window, broiler pan and grid, and oven light.
 - 6. Exterior Finish: Stainless steel.
 - 7. Manufacturers: Basis of Design
 - a. Frigidaire Home Products; Model FFED3025PS: www.frigidaire.com.
- D. Cooking Exhaust, EXH: Range hood.
 - 1. Size: 30 inches wide.

2. Fan: Three-speed, 300 cfm
 3. Exhaust: Rectangular, recirculated.
 4. Features: Include Halogen Lights, Baffle Filters.
 5. Exterior Finish: Stainless steel.
 6. Manufacturers: Basis of Design
 - a. Whirlpool Corp; UXT5230BDS: www.whirlpool.com.
- E. Microwave MIC: Over-the-range Microwave.
1. Capacity: 1.7 cubic ft.
 2. Power: 1700 watts.
 3. Features: Include Touch control panel with interactive visual display and 10 preset power levels..
 4. Finish: Stainless Steel.
 5. Manufacturers: Basis of Design
 - a. Samsung, MC17J8000CS.
- F. Dishwasher, Type DW: Undercounter.
1. Controls: Solid state electronic.
 2. Energy Usage: Must meet current ENERGY STAR® qualifications.
 3. Wash Levels: Three (3).
 4. Cycles: Five (5), including normal, rinse and hold, short, china/crystal, and pot and pan.
 5. Features: Include rinse aid dispenser, optional no-heat dry, optional water temperature boost, adjustable upper rack, and adjustable lower rack.
 6. Finish: Stainless steel.
 7. Manufacturers: Basis of Design
 - a. Samsung Waterwall: DW80J9945U.

2.02 EQUIPMENT

- A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.
- B. Clothes Washer and Dryer Comination with Steam Type WD: Electric, stationary, front-loading.
 1. Size: Compact. Capacity: 2.3 cu.ft.
 2. Controls: Solid state electronic, with electronic moisture-sensing dry control.
 3. Energy Usage: Must meet current ENERGY STAR® qualifications.
 4. Temperature Selections: 3.
 5. Washing Cycles: 14
 6. Drying Cycles: 7, Include normal, permanent press, knit/delicate, and air only.
 7. Features: Include interior light, sound insulation, end of cycle signal, and Child Lockout.
 8. Finish: Painted steel, color white.
 9. Manufacturers: Basis of Design
 - a. LG, WM3488HW.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Anchor built-in equipment in place.

3.03 ADJUSTING

- A. Adjust equipment to provide efficient operation.

3.04 CLEANING

- A. Remove packing materials from equipment and properly discard.

B. Wash and clean equipment.

END OF SECTION

SECTION 12 2300**ROLLER SHADE SYSTEMS****PART 1 - GENERAL****1.01 SUMMARY**

- A. This Section includes manually operated roller shade assemblies at locations as indicated on drawings fabricated and configured to perform as follows:
 - 1. Manual operation Sunscreen Units.
- B. Related Requirements
 - 1. Section 06 1000 - Rough Carpentry: Wood blocking and grounds for mounting roller shades and accessories.

1.02 SUBMITTALS

- A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
- B. Samples for Initial Selection: For each colored component of each type of shade indicated.
 - 1. Include similar Samples of accessories involving color selection.
- C. Samples for Verification:
 - 1. Complete, full-size operating unit not less than 16 inches (400 mm) wide for each type of roller shade indicated.
 - 2. For the following products:
 - 3. Shade Material: Not less than 12-inch- (300-mm-) square section of fabric, from dye lot used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of material.
- D. Product Certificates: For each type of roller shade, signed by product manufacturer.
- E. Qualification Data: For Installer.
- F. Product Test Reports: For each type of roller shade.
- G. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining roller shades and finishes.
 - 2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
 - 3. Operating hardware.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Source Limitations: Obtain roller shades through one source from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Resistance Ratings: Passes NFPA 701.
- D. Product Standard: Provide roller shades complying with WCMA A 100.1.
- E. Mockup: Build mockup of one Roller Shade assembly to verify selection made under sample submittal and to demonstrate aesthetic effect and set quality standards for materials and execution.
 - 1. Locate mockup at southern most opening to receive Roller Shades as indicated on drawings.
 - 2. Do not proceed with remaining work until mockup is accepted by Architect.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in factory packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same designations indicated on Drawings and in a window treatment schedule.

1.05 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.06 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Rollers Shades: Before installation begins, one motor, controller, and wall switch.

PART 2 - PRODUCTS

2.01 ROLLER SHADES

- A. Basis-of-Design Manufacturer
 - 1. Springs Window Fashions - SWF Contract® Solar Shading Systems Product Single roller, chain and clutch, manually operated, Window Shade units.
- B. Substitutions: Not permitted without full compliance with requirements of Section 01600 - Product Requirements.
- C. Visually Transparent Shade Cloth Material: non-raveling vinyl/polyester yarn, fabric thickness 0.025 inches (0.635 mm).
- D. Mounting Brackets: Fascia end caps, fabricated from steel finished to match fascia or headbox.
- E. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; length as indicated [on Drawings]; removable design for access.
- F. Top/Back Cover: L-shaped; material and finish to match fascia; combining with fascia and end caps to form a six-sided headbox enclosure sized to fit shade roller and operating hardware inside.
- G. Roller Shade Pocket: For recessed mounting in drywall ceilings as indicated on the Drawings.
 - 1. Provide either extruded aluminum and or formed steel shade pocket, sized to accommodate roller shades, with exposed extruded aluminum closure mount, tile support and removable closure panel to provide access to shades.
- H. Bottom Bar: Steel or extruded aluminum. Provide concealed, by pocket of shade material, internal-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.
- I. Mounting: Outside or Recessed in ceiling pocket mounting permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.
- J. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard for anchoring roller shade bottom in place and keeping shade band material taut.
- K. Shade Operation: Manual; with continuous-loop bead-chain, clutch, and cord tensioner and bracket lift operator.

2.02 ROLLER SHADE FABRICATION

- A. Product Description: Manual Chain-and-Clutch single roller operating mechanism
- B. Concealed Components: Non ferrous or corrosion-resistant-coated materials.
 - 1. Lifting Mechanism: With permanently lubricated moving parts.
- C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
 - 1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch (6 mm) from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.

- D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting fascia, roller, and operating hardware and for hardware position and shade mounting method indicated.
- E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.
- F. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
- G. Colors of Metal and Plastic Components Exposed to View: As selected by Architect from manufacturer's full range, unless otherwise indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, [accurate locations of connections to building electrical system,]and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow clearances for window operation hardware.

3.03 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.04 CLEANING AND PROTECTION

- A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.05 SCHEDULE - Contractor responsible for coordinating with window schedule for sizes. Field verify all dimensions and locations prior to installation.

END OF SECTION

SECTION 12 3530**RESIDENTIAL CASEWORK****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Residential Cabinets.
- B. Countertops.
- C. Cabinet hardware.

1.02 REFERENCE STANDARDS

- A. BHMA A156.9 - American National Standard for Cabinet Hardware; 2010.
- B. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material; 2013.
- C. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- D. KCMA A161.1 - Performance and Construction Standard for Kitchen and Vanity Cabinets; 2012.
- E. KCMA (DIR) - Directory of Certified Cabinet Manufacturers; current edition, online.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions and construction details.
- C. Samples: Submit two door and countertop samples, 12 x 12 inch in size, illustrating color and finish.

1.04 QUALITY ASSURANCE

- A. Products: Complying with KCMA A161.1 and KCMA Certified.
- B. Manufacturer: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.

1.05 MOCK-UP

- A. Provide full size mock-up of casework base unit.
- B. Mock-up may remain as part of the Work.

PART 2 PRODUCTS**2.01 MANUFACTURERS**

- A. Residential Casework:
 - 1. Wellborn Cabinet, Inc: www.wellborn.com.
 - 2. Substitutions: Not permitted.

2.02 COMPONENTS

- A. Cabinet Construction: Softwood lumber framing and particle board, tempered hardboard gables.
- B. Countertops:
 - 1. Solid Surface Countertops for manufactured casework as follows:
 - a. Natural Quartz and Resin Composite Countertops: Sheet or slab of natural quartz and plastic resin over continuous substrate.
 - b. Flat Sheet Thickness: 1/2 inch, minimum.
 - c. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; orthophthalic polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - 1) Manufacturers: Basis of Design
 - (a) Cambria® Surfaces: Product; Swanbridge®: www.cambria.com.
 - (b) Substitutions: Not permitted, unless you can find a better deal on the same material AND get concurrence of the Architect after offering a credit to the Owner!

- 2) Finish on Exposed Surfaces: Matte Gloss, or as indicated..
- 3) Color and Pattern: As indicated on drawings.
- d. Other Components Thickness: 3/4 inch, minimum.
- e. Back and End Splashes: Same sheet material, demi- or half-bullnose top; minimum 6 inches high, or as indicated.
- f. Fabricate in accordance with manufacturer's standard requirements.

C. Door and Drawer Fronts: Wood veneer over particle board.

2.03 HARDWARE

- A. Hardware: Selected by Architect from Manufacturer's full range of available options.
- B. Shelf Standards and Rests: Manufacturer's Standard.
- C. Drawer and Door Pulls: Brushed Stainless Steel Selected by Architect from Manufacturer's full range of available options, 4 inches - 8 inches wide., or as indicated
- D. Catches: Magnetic.
- E. Drawer Slides: Extension arms, steel construction.
- F. Hinges: European style, concealed, self closing.

2.04 FABRICATION

- A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
- B. Fabricate corners and joints without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.
- C. Fabricate each unit to be rigid and not dependent on building structure for rigidity.
- D. Provide cutouts for plumbing fixtures, appliances, and fixtures and fittings. seal contact surfaces of cut edges with 2 coats of clear, water repellant urethane sealer..

2.05 FINISHES

- A. Exposed to view surfaces: As selected by Architect from Manufacturer's standard line.
- B. Interior Surfaces: Mfr's standard thermally fused laminate board material, either woodgrain, or white..

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of support framing.

3.02 INSTALLATION

- A. Install casework, components and accessories in accordance with manufacturer's instructions.
- B. Use anchoring devices to suit conditions and substrate materials encountered.
- C. Set casework items plumb and square, securely anchored to building structure.
- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Use filler strips; not additional overlay trim for this purpose.
- E. Provide finish return ends of units, back splashes, shelves and bases.

3.03 ADJUSTING

- A. Adjust doors, drawers, hardware, fixtures, and other moving or operating parts to function smoothly.

3.04 CLEANING

- A. Clean casework, countertops, shelves, and hardware.

3.05 PROTECTION

- A. Do not permit finished casework to be exposed to dusty conditions, continued construction activity, nor to be used as a work surface, dining surface or construction material storage.

3.06 SCHEDULES See Drawings
END OF SECTION

SECTION 21 5451**SUMMARY****PART 1 GENERAL****1.01 RELATED DOCUMENTS**

- A. Division 1 – Section “ALTERNATES”: Coordinate related Division 21 work and modify surrounding work to integrate the Work of each Alternate.

1.02 SUMMARY

- A. Description of General Fire Protection Requirements. Applies to all Division 21, Section 21 5450's (Fire Protection).

1.03 DEFINITIONS

- A. "Provide" means to furnish and install, complete and ready for operation.

1.04 REFERENCES

- A. ASME: American Society for Mechanical Engineers.
- B. ASTM: American Society of Testing and Materials.
- C. AWWA: American Water Work Association.
- D. FM: Factory Mutual.
- E. NEMA: National Electrical Manufacturer's Association.
- F. NFPA: National Fire Protection Association.
- G. MSS: Manufacturer's Standardization Society of the Valve and Fitting Industry.
- H. UL: Underwriters Laboratories, Inc.

1.05 REGULATORY REQUIREMENTS

- A. Comply with current edition, unless otherwise noted, of the following codes and standards.
 - 1. ANSI B31.9 - Building Services Piping.
 - 2. ADA - American's with Disabilities Act.
 - 3. NFPA 13D – Installation of Sprinkler System.
 - 4. NFPA 101 - Life Safety Code.
 - 5. IRC – International Residential Building Code with Fire, Mechanical, Plumbing and Gas Codes.
- B. Permits, Licenses, Inspections and Fees.
 - 1. Obtain and pay for all permits, licenses, inspections and fees, and comply with all rules, laws and ordinances pertaining to the Contractor's portion of the Work.
 - 2. Obtain and pay for certificates of required inspections, and file certificates with Owner.

1.06 PRODUCT REQUIREMENTS

- A. Provide new standard, materials throughout.
- B. Multiple items of similar equipment shall be the product of the same manufacturer.

1.08 QUALITY ASSURANCE

- A. Installer's Qualifications: Firm experienced in installation of systems similar in size and complexity to those required for this project, plus the following:
1. Acceptable to, or licensed by, manufacturer.
 2. Not less than 3 years experience with systems.
 3. Successfully completed not less than 5 comparable scale projects using systems similar to those for this project.
 4. Professional Engineer licensed in the State in which the work occurs; NICET Level 3 and licensed by the State Fire Marshall in the State in which the work occurs. NICET Level 3 designer must be an employee of the Fire Protection Contractor. NICET Level 3 designer must inspect/oversee installation of shop drawings.

1.09 SUMMARY OF WORK

- A. Scope: Provide all labor, materials, equipment and services necessary for the completion of all fire protection work shown or specified, except work specified to be done or furnished by others, complete and ready for operation.

1.10 DRAWING INTERPRETATION AND COORDINATION

- A. Drawings are intended to show size, capacity, approximate location, direction and general relationship of one phase to another, but not exact detail or arrangement.
- B. Do not scale drawings for location of system components. Check all measurements, location of pipe, ducts, and equipment with the detail architectural, structural, and electrical drawings and conditions existing in the field and lay out work so as to fit in with ceiling grids, lighting and other parts.
- C. Make minor adjustments in the field as required to provide the optimum result to facilitate ease of service, efficient operation and best appearance.
- D. Where doubt arises as to the meaning of the Drawings and Specifications, obtain the Architect's written decision before proceeding with parts affected; otherwise assume liability for damage to other work and for making necessary corrections to work in question.
- E. Refer to Architectural Drawings for all dimensions and location of lights, ceiling diffusers and sprinkler heads.

END OF SECTION

SECTION 21 5453**SUMMARY****PART 1 GENERAL****1.01 SUMMARY**

- A. Description of common piping, equipment, materials and installation for Fire Protection systems.
- B. This Section includes the following:
 - 1. Piping materials and installation instructions common to most Fire Protection piping systems.
 - 2. Escutcheons
 - 3. Flashing
 - 4. Workmanship.
 - 5. Piping systems installation - Common Requirements.
 - 6. Equipment installation - Common Requirements.
 - 7. Supports and anchorages.
 - 8. Protection and cleaning of equipment and materials.

1.02 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for Plumbing installations.
- B. Coordinate installation of required supporting devices and set sleeves and inserts in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate installation of building access doors for fire protection items requiring access that are concealed behind finished surfaces.
- D. Electrical Characteristics for Fire Protection Equipment:
 - 1. Coordinate electrical system installation to match requirements of equipment actually furnished on this project.

PART 2 - PRODUCTS**2.01 PIPE, TUBE AND FITTINGS**

- A. Refer to individual Division 21 Fire Protection Piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.02 JOINING MATERIALS

- A. Refer to individual Division 21 Fire Protection Piping Sections for special joining materials not listed below.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- D. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated.

2.03 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
 - 1. Finish: Polished chrome-plated.

PART 3 - EXECUTION**3.01 WORKMANSHIP**

- A. First class and in accordance with best practice. Work to be orderly, neat, workman-like in appearance and performed by skilled craftsman.
- B. Poor or improper workmanship shall be removed and replaced as directed by the Architect without additional cost to the Owner or design professionals.

3.02 CUTTING AND PATCHING

- A. Comply with the requirements of other Divisions for the cutting and patching required to accommodate the installation of Fire Protection work. Repair and finish to match surrounding.

3.03 PIPING SYSTEMS INSTALLATION - COMMON REQUIREMENTS

- A. Drawings, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas and stairwells.
- C. Install piping indicated to be exposed and in service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping to permit valve servicing.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections. No mitering or notching for fittings permitted.
- H. Select system components with pressure rating equal to or greater than system operating pressure.
- I. Install escutcheons where exposed piping penetrates walls, ceilings, and floors in finished spaces.

3.04 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 21 Fire Protection Piping Sections specifying piping systems.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

3.05 PIPE CLEANING

- A. Keep pipe clean and free of dirt. Keep caps on ends of pipe when it is stored on site and reinstall caps on ends of installed piping at the end of each day.

3.06 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations.
- D. Install equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with Contract Documents, obtain Architect's decision before proceeding.
- E. Install equipment to allow right of way for piping installed at a required slope.

3.07 PROTECTION AND CLEANING OF EQUIPMENT, FIXTURES, AND MATERIALS

- A. Equipment and materials shall be carefully handled, properly stored, and protected from weather, dust-producing procedures, or damage during construction.
- B. At completion of all work, thoroughly clean exposed materials (pipe, etc.) and equipment and make ready for painting.

END SECTION 21 5453

SECTION 21 5455**SUMMARY****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Pipe, Fittings, Valves for:
 - 1. Wet sprinkler system.

- B. System design and installation. Base system design hydraulic calculations using the area/density method on the following criteria and in accordance with NFPA 13D latest edition.
 - 1. Comply with shop drawing requirements as required by the City of Birmingham.

1.02 RELATED SECTIONS

- A. Section 22 5405 – Plumbing Identification.
- B. Section 21 5451 – General Fire Protection Requirements.
- C. Section 21 5453 – Basic Fire Protection Materials and Methods.

1.03 SYSTEM

- A. A wet sprinkler system providing coverage for the entire building.

1.4 SUBMITTALS FOR REVIEW

- A. Submit under provisions of Division 1, Section “Submittal Procedures” and the following:
- B. Product Data: Submit to the Architect and obtain his approval of a complete list of materials and equipment which are to be furnished under Division 21.
 - 1. List shall be complete with manufacturer’s names, catalog number, dimensions, specifications, rating data and options utilized. Capacities shall be in the terms specified.
 - 2. Call attention to deviations from specified items as to operation and physical dimensions.
 - 3. Performance curves for equipment such as pumps shall be included.
 - 4. Final equipment orders shall not be placed until submittals have been returned marked “No Exceptions Noted” or “Make Corrections Noted”.
 - 5. Bind all equipment submittals and provide index tab for each type of equipment. Submit all at one time. Reserve two sets for project close-out documents.

1.05 SYSTEM INSTALLATION AND INSPECTION

- A. Acceptance Inspections & Testing:
 - 1. Allow fire protection and life safety systems installation and acceptance test must be inspected, test, witnessed and approved by an AHJ and Owner’s representative.

- F. Plans Review & Approval:

1. All fire protection and life safety system drawings and specifications must be reviewed by this AHJ to ensure code compliance prior to start of any work.

1.06 REGULATORY REQUIREMENTS

- A. Materials: Conform to UL and FM Global Requirements and Standards.
- B. Sprinkler System: Conform to NFPA 13D, State of Alabama Fire Marshall Requirements, City of Birmingham Fire and Rescue Requirements and Insurance Underwriter.
- C.. NFPA 25, Inspections, Testing and Maintenance of Water-Based Fire Protection Systems.
- E. Applicable Building Codes.

PART 2 - PRODUCTS

2.01 PIPING BELOW GRADE AND BELOW SLAB ON GRADE

- A. Ductile Iron: Cement lined ANSI A-21.50.
- B. Joints on Ductile Iron: Standard mechanical joint ANSI A-21.11. Provide with retainer glands at all fittings and thrust blocks minimum 1 cubic yard of concrete at all changes of direction.

2.02 WET SPRINKLER SYSTEM

- A. Wet System - Above Ground Piping:
 1. Shall be blazmaster cpvc. Pipe and Fittings shall be of one manufacturer.
- B. Exposed - Above Ground Piping:
 1. Galvanized Pipe:
 - a. All piping 2" and smaller, all piping larger than 2" with cut grooves on threaded, Schedule 40 galvanized steel ASTM A53, ASTM A795, ASTM A135.
 - b. Galvanized iron threaded fittings, ANSI B16.3.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Install piping in accordance with NFPA 13 D for sprinkler systems,
- C. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- D. Install piping to conserve building space, to not interfere with use of space and other work.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- K. Do not penetrate building structural members unless indicated.

- L. Provide sleeves when penetrating floors and wall. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.
- M. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.
- N. Die cut threaded joints with full cut standard taper pipe threads and connect with Teflon tape or Teflon pipe compound applied to male threads.
- O. Heads to be installed with ambient temperature rating compliance.

END OF SECTION

SECTION 01 1000**SUMMARY****PART 1 GENERAL****1.01 SCOPE:**

- A. Provisions of this Section apply to all Plumbing work.
- B. Include the provisions of General, Supplementary and Special Conditions and provisions of the Specifications shall apply to and form a part of this Section.
- C. Provide all labor, materials, equipment, and services necessary for the completion of all work shown or specified, except work specifically specified to be done or furnished under other sections of the Specifications. Include performing all operations in connection with the complete installation in strict accordance with the specification and applicable drawings subject to the terms and conditions of the Contract, for the following system:
 - 1. A system of sanitary waste and vent piping.
 - 2. A system of domestic water piping.
 - 3. A system of storm water piping.

1.02 DRAWINGS:

- A. Drawings are diagrammatic and subject to requirements of Architectural Drawings. Drawings indicate generally the location of components and are not intended to show all fittings or all details of the work. Coordinate with Architectural, Structural, Electrical, HVAC and other Building Drawings.
- B. Follow the Drawings closely, check dimensions with Architectural Drawings and field conditions. DO NOT scale Drawings for location of system components.

1.03 APPLICABLE CODES AND STANDARDS:

- A. Comply with the current editions of the following Codes and Standards:
 - 1. ANSI/ASHRAE 15 - Code for Building Services Piping.
 - 2. NFPA 70 - National Electrical Code.
 - 3. Other Standards as referenced in other Sections of Division 15.
 - 4. Local Building Code (International Building Code if no local Building Code in effect).
 - 5. Local Plumbing Code (International Plumbing Code if no local Plumbing Code is in effect).

1.04 QUALIFICATIONS OF SUBCONTRACTOR:

- A. The Plumbing Contractor shall meet the following qualifications:
 - 1. The Plumbing Contractor shall have a satisfactory experience record with Plumbing installations of character and scope comparable with this project, and for at least three (3) years prior to the Bid Date and shall have had an established service department capable of providing service inspection or full maintenance contracts.

1.06 WORKMANSHIP:

- A. Contractor shall install all work in a neat and first-class manner. Remove and replace work not completed in such a manner as directed by the Architect.

1.07 COOPERATION:

- A. Cooperate with all other crafts. Perform work in a timely manner. Do not delay the execution of other work.

PART 2 - PRODUCTS:

2.01 MATERIALS, SUBSTITUTIONS AND SUBMITTALS:

- A. Unless otherwise noted, provide new, standard, first-grade materials throughout. Equipment and materials furnished shall be fabricated by manufacturers regularly engaged in their production and shall be the standard and current model for which replacement parts are available. Equipment shall be substantially the same equipment of a given manufacturer which has been in successful commercial use and operation for at least three (3) years.
- B. Where materials or products are specified by manufacturer's name, brand, trade name, or catalog reference, such named materials or products shall be the basis of the Bid, without substitution, and shall be furnished under the Contract unless requests for substitutions are approved as noted below. Where two or more brands are named the choice of these shall be optional with the Contractor.
- C. Substitutions will be considered only if written request for approval has been received by the Architect TEN (10) DAYS prior to the date established for receipt of Proposals. Each request shall include the name of the material or equipment for which substitution is proposed and a complete description of the proposed substitute including drawings, cuts, performance and test data, samples and any other information necessary for evaluation. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute may require shall be included. The burden of proof of the merit of the proposed substitute is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution is final.
- D. Similar items of equipment shall be the product of the same Manufacturer.

PART 3 - EXECUTION:

3.01 PROTECTION OF EQUIPMENT:

- A. During construction all fixtures and equipment shall be protected from damage caused by weather, masonry, plaster, paint and job accidents.
- B. When installation is complete, clean equipment and make ready for painting. Adjust all flush valves.

3.02 INSTALLATION OF FIXTURES AND EQUIPMENT:

- A. Install fixtures and equipment to provide normal service access to all components.
- B. Provide sufficient space for removing components, install fixtures and equipment to provide such clearance.

- C. Install fixtures and equipment in accordance with manufacturer's instructions. If manufacturer's instructions conflict with contract documents, obtain Architect's decision before proceeding.
- D. All fixtures and equipment shall be firmly fastened in place:
 - 1. All wall hung fixtures shall be installed on a floor mounted fixture support with anchoring bolts in all holes of each leg. Bolts shall be sized as per manufacture's recommendation.

3.04 INCIDENTAL WORK:

- A. All power wiring is included in Electrical Section.
- B. Permanent drain and relief connections for Plumbing Equipment to nearest floor drain or to grade are included in this Section whether shown or not.
- C. Items obviously omitted from drawings and/or specifications shall be called to attention of the Architect prior to submitting Bid, after award of Contract any changes or rearrangements necessary to complete Contract shall be at no additional cost to Owner.

3.05 FLASHING:

- A. Vent Pipe and Roof Drain Flashing: Specified in "Architectural Roofing Section".
- B. Coordinate all roofing penetrations with Roofing Section.

3.11 WARRANTY AND INSTRUCTIONS:

- A. See General Conditions - One-Year Warranty.
- B. Contractor shall and hereby does warrant all materials, workmanship and equipment furnished and installed by him to be free from defects for a period of one (1) year after date of substantial completion of the Contract. Should any defects in materials, workmanship, or equipment be made know to Contractor within the one (1) year warranty period, Contractor shall replace such materials, workmanship, or equipment without charge.
- C. After completion of the work, Contractor shall operate the equipment which he installs for a period of ten (10) working days, as a test of satisfactory operating conditions. During this time, Contractor shall instruct the Owner's operating personnel in the correct operation of the equipment. Furnish necessary oral and written operating instructions to the Owner's representative.
- D. Provide three (3) sets of manufacturer's operating and maintenance manuals and parts lists including nearest manufacturer's sales and service representative by name, address and phone for all equipment and materials furnished. Provide a maintenance schedule listing routine maintenance operations and suggested frequency there of. Include all warranty dates on equipment and guarantees. Include names, address and phone of any subcontractor and work performed. Bind above items in loose leaf three (3) ring binders with tab for each class of equipment.
- E. During the period of tests, adjust all controls, regulators, etc., to comply with these Specifications.
- F. Make available to the Owner, without additional cost, service and adjustment of the equipment for the guarantee period.

END OF SECTION

SECTION 22 5420**TESTING, CLEANING AND ADJUSTING (TCA)****SECTION 22 5420****SUMMARY****PART 1 GENERAL****1.01 SCOPE:**

- A. Provisions of this section apply to all Plumbing work.
- B. Include Section 22 5410, "GENERAL PROVISIONS - PLUMBING", with this Section.
- C. All tests shall be witnessed by the Architect in addition to authorities having jurisdiction. A minimum of 48 hour notice is required prior to performance of test.

PART 2 – PRODUCTS – NOT USED**PART 3 - EXECUTION:****3.01 GENERAL REQUIREMENTS:**

- A. After system have been installed, Test, Balance and Adjust System for proper operation, flow rates, pressures and temperatures. Correct any noise and/or vibration conditions.
- B. Perform all tests as required by local codes. Contractor shall furnish testing equipment. Keep a record of all tests indicating dates of tests, those persons witnessing tests and results of tests.
- C. Provide with the Close-Out Documents a Testing Record.
- D. If local Codes are more stringent, local Codes shall govern.

3.02 SANITARY AND STORM SYSTEM:

- A. Test piping by stopping lower outlets and filling with water to 10' hydrostatic head. Stop leaks and repeat test until watertight. All joints shall be exposed throughout test.
- B. Provide "Ball Test" on all piping 3" and larger with ball 1/2" smaller than pipe diameter.
- C. Provide visual inspection of all building drain piping below grade. Visual inspection shall be by means of a video camera routed through the drain system. Where the drain piping is connected to existing drain piping, the visual inspection shall include the existing drain piping from the point of connection, downstream to the point of connection to the public utility. A video tape and written report, noting any defects, on the findings of the visual inspection shall be provided to the owner with the close-out documents. The Plumbing Contractor shall provide personnel and equipment required for the visual inspection.

3.03 DOMESTIC WATER PIPING:

- A. On completion of roughing-in, cap all outlets, make connections with house supply line,

and put under full water pressure. Test by applying additional pressure (by temporary pump or compressed air connection) to total hydrostatic pressure 1-1/2 times street pressure but not less than 150 psig for not less than 4 hours.

- B. Immediately and completely stop all leaks and retest until system is watertight. After testing, leave general pressure on until ready to install fixture (except when necessary to drain to avoid freezing during construction). After completion of all tests, repairs and installation of fixtures, flush all domestic hot and cold water piping with water to remove all sediment scale and until water runs clear, then disinfect.

END OF SECTION

SECTION 22 5450

MATERIALS AND METHODS – PLUMBING

SECTION 01 1000

SUMMARY

PART 1 GENERAL

1.01 SCOPE:

- A. Include Section 22 5410, "GENERAL PROVISIONS - PLUMBING", with this Section.

PART 2 - PRODUCTS:

2.01 MATERIALS:

- A. All pipe, fittings, and valves shall be manufactured in the United States of America.
- B. **Pipe and fittings to be the same manufacturer.**

2.02 SANITARY WASTE AND VENT PIPING, ABOVE SLAB ON GRADE

- A. PVC Pipe:
 - Pipe: Schedule 40, ASTM D2665 and ASTM D1785.
 - Fittings: PVC with DWV pattern, ASTM D2665.
 - Joints: ASTM D2855, solvent weld with ASTM F-656 purple primer and ASTM D2564 solvent cement.

2.03 STORM WATER PIPING

- A. PVC Pipe:
 - Pipe: Schedule 40, ASTM D2665 and ASTM D1785.
 - Fittings: PVC with DWV pattern, ASTM D2665.
 - Joints: ASTM D2855, solvent weld with ASTM F-656 purple primer and ASTM D2564 solvent cement.

2.04 DOMESTIC WATER PIPING:

- A. Domestic Water Pipe and fittings: Uponor Pex Pipe. .
- B. Mechanical room piping to be Copper .

2.08 VALVES:

- A. Domestic Water Piping Valves: All Valves shall be LEAD Free in accordance with Federal Lead Free Law.
 1. Ball Valves: All shut off valves shall be Ball Valves. Valves shall be bronze, 150 psig WP, chrome plated bar stock ball, full port Teflon seats, stem packing seal and thrust washer, Watts LFB-6080 or B-6081 for 2" and under. Watts LFFBV-3C for valves 2 1/2" and greater. Provide valve handle extension to (minimum 1") clear insulation. Appollo, Red White and Kitz equal. For valves in boxes exterior provide with locking handle.
 2. Check valves 2" and smaller: All bronze, 125 psig WP, bronze disc, swing check, Stockham B-309, Crane 1342, Milwaukee 1509, Red White 237, Kitz 14.
 3. Water pressure reducing valves: Watts, Wilkins, or Cash Acme, complete with inlet strainer, unions, inlet and outlet pressure gages and shut-off valve up stream of strainer.

2.09 PIPE HANGERS:

- A. General: Pipe hangers, Grinnell, PHD, Michigan Hanger, or Elcen. Grinnell figure numbers are given for reference. Provide copper clad hangers on bare copper lines. Hanger, allthread unistrut, bolts, etc to be manufactured by one manufacturer.

PART 3 - EXECUTION:**3.01 PIPE INSTALLATION:**

- A. All piping shall be securely anchored in place to the Building Structure.
- B. Cut pipe square and ream full size after cutting. Clean pipe. Make threaded joints with Teflon tape. Do not spring pipe into place.
- C. Install piping to allow for expansion. Make connections to all equipment to eliminate undue strains in piping and equipment. Furnish necessary fittings and bends to avoid spring of pipes during assembly.
- E. Wherever ferrous pipes or tanks and copper tubing connect, provide dielectric insulation unions or couplings, equal to EPCO.
- J. Run piping concealed, except where specifically shown or specified exposed. Plumb all vertical lines and run mains parallel to building walls unless specifically shown otherwise.

3.02 INSTALLATION OF VALVES:

- A. Provide shut-off valves where shown and detailed on Drawings and Specifications.
- B. Locate valves to isolate each item to facilitate maintenance and/or removal.
- C. Locate valves in piping connections to water heaters, etc., so heads and tube bundles can be removed without disconnecting equipment or piping other than union or flange connections immediately adjacent to heat exchangers.
- D. Provide sweat to screw adapters where required.
- E. Provide and install a water pressure reducing valve(s) immediately upon entering building or as shown on Drawings. The P.R.V. shall be line size and have an integral strainer or separate WYE strainer up stream of P.R.V. Provide a ball or gate valve immediately upstream of P.R.V. and strainer.

END OF SECTION

SECTION 22 5480**SUMMARY****PART 1 GENERAL****1.01 SCOPE:**

- A. Include Section 22 5410 "GENERAL PROVISIONS - PLUMBING", with this Section.
- B. "Exposed" is defined as: Exposed to view when construction is complete. Items which are not "exposed" are "concealed".
- C. Insulate all items subject to sweating or loss of heat. Insulation shall be installed by licensed applicator accordance with the Manufacturer's Recommendations.

1.02 INSULATION REQUIREMENTS:

- A. Comply with NFPA 90A.
- B. Pipe hanger saddles are specified in Section 22 5450 "MATERIALS AND METHODS – PLUMBING".
- C. Use insulation and adhesives with Underwriter's Laboratories flame spread rating not over 25 without evidence of continued progressive combustion, and smoke developed rating not exceeding:

PART 2 - PRODUCTS:**2.01 FOAMED PLASTIC PIPE INSULATION**

- A. Manufacturer: Armaflex AP.
- B. Insulation: ASTM C534; flexible cellular elastomeric insulation, pre-slit or slip on.
 - 1. 'K' value: ASTM C177; 0.27 at 75 degrees F.
 - 2. Minimum service temperature: -40 degrees F.
 - 3. Maximum service temperature: 220 degrees F.
 - 4. Moisture vapor absorption: ASTM D1056; 5.0 percent by weight.
 - 5. Moisture vapor transmission: ASTM E96; 0.10 perm-inches.
 - 6. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried adhesive, compatible with insulation.
- D. Protective Coating: Weather resistant, compatible with insulation.
- E. Do not use in plenum unless meets ASTM E-84 flame spread rating of less than 25 and smoke density rating of less than 50.

2.07 INSTALLATION

- A. Install in accordance with NAIMA National Insulation Standards.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Fit pipe hangers over insulation.

PART 3 - EXECUTION:**3.01 PLUMBING PIPING INSULATION:**

- A. Cold (Potable) water piping, interior, above grade: "Fiberglass Pipe Covering", 1" thick. Pipe insulation in partitions

and chases may be 1/2" thick.

- D. Hot water piping, interior, above grade: "Fiberglass Pipe Covering", 1" thickness. Pipe insulation in partitions and chases may be 1/2" thick.
- E. All exposed hot and cold water piping in Mechanical Rooms, Janitor's Closets, ETC and Water Heater Rooms.

END OF SECTION

SECTION 22 5490**FIXTURES AND EQUIPMENT - PLUMBING****PART 1 - GENERAL:****1.1 SCOPE:**

- A. Include Section 22 5410, "GENERAL PROVISIONS - PLUMBING", with this Section.
- B. Pay particular attention to requirements in the General Provisions for substitution of products not named or listed as substitutions.
- C. Domestic Hot Water - A Central System will be provided for Kitchen. Administrative Areas, Classroom Wings shall be served from individual water heaters to isolate system.
- D. Commercial Grade Fixtures will be provided. All wetted surfaces will be LEAD Free.

PART 2 - PRODUCTS:**2.1 DRAINS: Reference Plumbing Detail Sheet****2.2 WALL HYDRANT:**

- A. J.R. Smith #5509-QT, with integral backflow preventer, latching cover, freeze-proof and of proper length for wall in which installed, all bronze box. Valve seat must be on building side of exterior wall insulation. Install with center line 24" above finish grade. Provide Owner with one (1) loose key for each wall hydrant.

2.3 HOSE BIBBS:

- A. Hose Bibb: Chicago Faucet #952 chrome-plated with removable tee handle in finished areas, and #998 in unfinished areas. Install with centerline 24" above finish floor and provide Owner one (1) loose key for each loose key hose bibb.

2.4 CLEANOUTS:

- A. Furnish and install cleanouts where indicated on drawings and at all 90-degree bends, angle, upper terminals and not over 50 feet apart on straight runs.
- F.

2.5 PLUMBING FIXTURES AND EQUIPMENT:

- A. See plans.

PART 3 - EXECUTION:**3.1 INSTALLATION:**

- A. Equipment shall be installed in accordance with manufacturer's recommendation.

- B. See details for mounting instruction and accessories.
- C. Stops and supplies are to be installed with chrome plated brass nipples penetrating wall with deep escutcheon at wall. Compression type stops are not acceptable.

END OF FIXTURES AND EQUIPMENT – PLUMBING

SECTION 23 0700**INSULATION-HVAC****PART 1 GENERAL****1.01 REQUIREMENTS**

- A. Insulate all items subject to sweating or loss of heat.
- B. Comply with NFPA 90A.
- C. Use insulation and adhesives with Underwriter's Laboratories flame spread rating not over 25 without evidence of continued progressive combustion, and smoke developed rating not exceeding 50 for all other pipe, duct and equipment insulation.

PART 2 PRODUCTS**2.01 FOAM PLASTIC PIPE COVERING**

- A. Fire retardant foamed plastic pipe covering, maximum K factor at 75°F mean temperature not exceeding 0.27 BTU/(hr) (sq. ft.) (°F/in). Armstrong "Armaflex II", or approved equal.

2.02 DUCT INSULATION, EXTERNAL FOR CONCEALED

- A. Formaldehyde free flexible glass fiber insulation with foil-scrim-craft (FSK) facing equal to Johnson Manville Micro-Lite 2XG@. Flame spread classification, 25 or less, smoke developed rating not exceeding 50. Minimum density, 3/4 lb./cu. ft., 2" thickness, installed R=6.0 minimum.

PART 3 EXECUTION**3.01 HVAC PIPING INSULATION**

- A. Refrigerant Suction Lines: "Foam Plastic Pipe Covering", 1" thick.

3.02 DUCT INSULATION, EXTERNAL, FOR CONCEALED DUCTS

- A. Thickness and Extent:
 - 1. All supply, outside air, return ductwork and all ductwork associated with heat pump water heater: 2" thick.

END OF SECTION

SECTION 23 0900**CONTROLS****PART 1 GENERAL****1.01 SCOPE**

- A. Provisions of this Section shall apply to all HVAC work.

PART 2 PRODUCTS**2.01 CONTROL SYSTEMS**

- A. Furnish and install Siemens Controls utilizing the Apogee platform and PXC Modular network controller system. Siemens shall furnish and install a fully integrated building automation system (BAS), incorporating direct digital controls (DDC) for energy management, equipment control and monitoring, and subsystems as defined in the project.

2.02 CONTROL WIRING

- A. Include control and interlock wiring and power wiring for control panel in this Section. Install in conduit in accordance with provisions of Electrical Work where exposed, concealed in walls or above ceilings other than lay-in type. Provide plenum rated cable above lay-in ceilings (for plenum or non-plenum).
- B. Waterproof and firestop all conduit floor penetrations. Firestop conduit penetrations of fire rated walls partitions.
- C. Wire all devices individually to terminal strips in control panels.
- D. Furnish necessary relays and auxiliary contactors and other accessories required. Provide interlock relays per NEC.

2.03 CONTROL SEQUENCES

- A. As shown on drawings.

PART 3 EXECUTION**3.01 INSTALLATION**

- A. Control diagrams on drawings and/or Control Sequences are intended to indicate, in general, control arrangements. Provide all instruments, relays, operators, switches, etc. required to accomplish control sequences whether or not such devices are actually shown.

END OF SECTION

SECTION 23 2100**MATERIALS AND METHODS HVAC****PART 1 GENERAL****1.01 SCOPE**

- A. Submittals: Product data.

PART 2 PRODUCTS**2.01 HVAC DRAIN PIPING**

- A. Standard weight galvanized steel pipe ASTM A-120 with galvanized malleable iron fittings, or type "L" hard copper with wrought copper sweat fittings or schedule 40 PVC.
- B. Provide drain traps for AC Unit drain pans.

2.02 REFRIGERATION PIPING

- A. ACR hard drawn copper tubing with wrought copper sweat fittings. Joints: Silfossed with continuous flow of dry nitrogen through lines.
- B. Size suction and discharge lines so as to insure oil return at minimum loading.
- C. Small lines 5/8" OD and smaller may be soft copper with flare fittings, provided that all joints are exposed for visual inspection.
- D. Refrigerant piping shall be sized and installed as recommended by the equipment manufacturer. Provide lift traps or double suction risers as required for oil return.

PART 3 EXECUTION**3.01 PIPE INSTALLATION**

- A. Cut pipe square and ream full size after cutting. Clean pipe. Make threaded joints with Teflon tape. Do not spring pipe into place.
- B. Pitch air conditioning unit drain lines down in direction of flow 1" in 20'.

3.02 REFRIGERATION SYSTEM

- A. Split Systems: When system is complete, but before the pipe covering has been installed, test components with dry nitrogen and make tight at equipment manufacturer's recommended test pressures. Then evacuate the system to 26" Hg. vacuum which the system shall hold for 24 hours. After passing the above tests, charge and leak test under operating conditions using electronic leak detector.

END OF SECTION

SECTION 23 3100**DUCTWORK****PART 1 GENERAL****1.01 SCOPE**

- A. Provisions of this Section shall apply to all HVAC work.

PART 2 PRODUCTS**2.01 DUCTWORK - GENERAL**

- A. Construct ducts of galvanized steel sheet metal using gauges and recommended details as contained in the current edition of the SMACNA HVAC Duct Construction Standards. Ductwork shall include supply air, exhaust air, return air, and outdoor air ducts, together with all necessary fittings, splitters, dampers, quadrants, flexible connections, sleeves, hangers, support, braces, etc. Hang and install ducts in a neat and workmanlike manner from structural members (not roof deck) with adequate bracing and cross bracing to prevent breathing, rattling, and vibration.
- B. Duct dimensions shown are net inside dimension and do not include insulation thickness.
- C. Duct Turns: Wherever possible, duct turns shall have a centerline radius equal to 1.5 times the duct width in the plane of the turn. Vane other duct turns to provide a dynamic loss coefficient ("C") not greater than 0.2. No reducing ells or tees to be used.
- D. Duct Sealing: Seal duct seams and joints as noted below. Seal entire circumference of all branch duct connections, tapping collars and spin-ins. Seal ducts using mastic sealant equal to United Duct Sealer.
 - 1. Class "A" Seal: Seal all joints and seams and leak test as specified.
 - 2. Class "B" Seal: Seal entire circumference of all transverse joints, seal all longitudinal joints.
 - 3. Class "C" Seal: Seal entire circumference of all transverse joints.
 - 4. Class "D" Seal: Seal corner of transverse joints.

2.02 DUCTWORK - LOW PRESSURE

- A. Ductwork: Low Pressure, Pressure and Seal Class shall include: all supply ductwork, all return ductwork, all outside air ductwork, and all exhaust ductwork.
 - 1. 2" pressure class, Class "B" seal.
- B. Construct ducts in accordance with SMACNA Duct Construction Standards for pressure and seal classes noted.

2.05 FLEXIBLE DUCTS

- A. Flexible duct connectors: A two (2) element spiral construction composed of galvanized steel supporting spiral and coated woven textile fabric with metal or mineral base, UL listed as Class I Air Duct and Connector (UL 181) minimum R=6.0.
- B. Make connections between flexible ducts and other equipment using galvanized steel draw bands with plated screws and buckles and United Duct seal for high and medium pressure ducts and nylon draw bands for low pressure ducts.

PART 3 EXECUTION**3.01 INSTALLATION**

- A. Ductwork shall be installed in accordance with manufacturer's recommendations.
- B. See details for mounting instructions and accessories.

END OF SECTION

SECTION 23 3700**OUTLETS****PART 1 GENERAL****1.01 SCOPE**

- A. Provisions of this Section shall apply to all HVAC work.

PART 2 PRODUCTS**2.01 GRILLES, REGISTERS AND DIFFUSERS**

- A. General: Air devices may be Titus, Price, or approved equal.
- B. Supply Registers (SR): Adjustable vertical deflection, adjustable horizontal deflection, removable core, opposed blade damper and multi-blade scoop and baked aluminum enamel finish. Titus "272".
- C. Wall Return Grilles (WRG): Horizontal bars fixed at about 35° angle, close spacing and plaster frames. Baked aluminum, enamel finish. Titus "350".
- D. Ceiling Return Grilles (R), Ceiling Exhaust Grilles (E) and Transfer Air Grilles (TAG): All aluminum, 1/2" X 1/2" X 1/2" cube core and plaster frames as needed. Off-white baked enamel finish. Provide 24 x 24 panel so grille will fit in 24 x 24 ceiling grid. Titus "50F".

2.02 WEATHER LOUVERS

- A. Louvers shall be 6" thick extruded aluminum louvers with 12 gauge blades with drainable head frame, drainable blades, water stop, and with angled sill. 57% F.A. minimum. Equip with 1/2" mesh aluminum birdscreen on inside of louver. Finishes: mill. Submit color sample to Architect (20 year warranty on finish). Ruskin ELF6375DX, Greenheck Louvers and Dampers or approved equal.

END OF SECTION

SECTION 23 5700**ENERGY RECOVERY VENTILATORS****PART 1 GENERAL****1.01 SCOPE**

- A. Energy Recovery Ventilator (ERV) shall be a packaged unit as manufactured by RenewAire and shall transfer both sensible and latent energy using static plate core technology.

PART 2 PRODUCTS**2.01 ENERGY RECOVERY VENTILATORS**

- A. The energy recovery component shall be of fixed-plate cross-flow construction, with no moving parts.
- B. No condensate drain pans or drains shall be allowed and unit shall be capable of operating in both winter and summer conditions without generating condensate.
- C. The unit case shall be constructed of 24-gauge steel, with lapped corners and zinc-plated screw fasteners. The case shall be finished with textured, powder coat paint. Access doors shall provide easy access to blowers, ERV cores, and filters. Doors shall have an airtight compression seal using closed cell foam gaskets. Case walls and doors shall be fully insulated with 1 inch, expanded polystyrene foam insulation faced with a cleanable foil face on all exposed surfaces.
- D. The ERV cores shall be protected by a MERV-8 rated, spun polyester, disposable filter in both airstreams.
- E. The unit shall have a line-cord power connection and be supplied with an internal 24 VAC transformer and relay. Standby power draw shall not exceed 1 Watt for the unit along with an optional automatic control.
- F. The ERV shall be capable of transferring both sensible and latent energy between airstreams. Latent energy transfer shall be accomplished by direct water vapor transfer from one airstream to the other, without exposing transfer media in succeeding cycles directly to the exhaust air and then to the fresh air.

PART 3 EXECUTION**3.01 INSTALLATION**

- A. Unit shall be installed in accordance with manufacturer's recommendations.
- B. See details for mounting instructions and accessories.

END OF SECTION

SECTION 23 8126**MINI-SPLIT UNITS****PART 1 GENERAL****1.01 SCOPE**

- A. Provisions of this Section shall apply to all HVAC work.

PART 2 PRODUCTS**2.01 MINI-SPLIT UNITS**

- A. The system shall be a Carrier system with Variable Speed Inverter Compressor technology. The system shall consist of wall suspended indoor section with wired, wall mounted controller and a horizontal discharge, single phase outdoor unit.
- B. Warranty
1. The units shall have a manufacturer's parts and defects warranty for a period one (1) year from date of installation. The compressor shall have a warranty of 5 years from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.
- C. Indoor Unit
1. The indoor unit shall be factory assembled, wired and tested. Contained within the unit shall be all factory wiring and internal piping, control circuit board and fan motor. The unit in conjunction with the wired, wall mounted controller shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be purged with dry nitrogen before shipment from the factory.
 2. Control
 - a. The control system shall consist of two (2) microprocessors, one on each indoor and outdoor unit, interconnected by a single non-polar two-wire cable. Field wiring shall run directly from the indoor unit to the wall mounted controller with no splices.
 - f. The indoor unit shall be connected to a wall mounted wired controller to perform input functions necessary to operate the system. The wired controller shall have a large multi-language DOT liquid crystal display (LCD) presenting contents in eight (8) different languages, including English, French, Chinese, German, Japanese, Spanish, Russian, and Italian. The controller shall have a Bacnet interface.
- D. Outdoor Unit
1. The outdoor unit shall be compatible with the three different types of indoor units (wall mounted, ceiling suspending, and four way ceiling cassette). The connected indoor unit must be of the same capacity as the outdoor unit.
 2. The outdoor unit shall be equipped with a control board that interfaces with the indoor unit to perform all necessary operation functions.
 3. The outdoor unit shall be capable of operating at 0°F (-18°C) ambient temperature without additional low ambient controls (optional wind baffle may be required).

PART 3 EXECUTION**3.01 INSTALLATION**

- A. Units shall be installed in accordance with manufacturer's recommendations.
- B. See details for mounting instructions and accessories.

END OF SECTION

SECTION 26 0500 - ELECTRICAL GENERAL**PART 1 - GENERAL****1.01 RELATED DOCUMENTS**

- A. The "General Conditions" and "Special Conditions" of Contract as written and referred to hereinbefore are adopted and made part of Division 16.

1.02 DESCRIPTION OF WORK

- B. Provide equipment, labor, etc., required to install complete working electrical system as shown and specified.
- C. Provide fixed electrical equipment, except where specifically noted otherwise.
- D. Provide portable electrical equipment for complete system.
- E. Provide equipment and/or wiring normally furnished or required for complete electrical systems but not specifically specified on the drawings or in specifications, as though specified by both.
- F. All equipment and wiring shall be new.
- G. Electrical work includes, but is not limited to:
 - 1. Arrange with local utility companies for services as shown or specified.
 - 2. Removal or relocation of electrical services located on or crossing through project property, above or below grade, obstructing construction of project or conflicting with completed project or any applicable code.
 - 3. Alterations and additions to existing electrical systems.
 - 4. Complete 600 volt Distribution System. Provide meters, switchboards, panelboards, circuit breakers, power outlets, convenience outlets, switches, and/or other equipment forming part of system.
 - 5. Complete raceway systems for telephone system.
 - 6. Connection of all appliances and equipment.
 - 7. Alterations and additions to emergency lighting and power system.
 - 8. Alterations and additions to existing fire alarm system.
 - 9. Complete empty raceway system(s) for auxiliary system(s) as shown.
 - 10. Complete system of outlets and raceways for master television antenna system.
 - 11. Complete raceway systems for voice data system.

12. Complete interior and exterior lighting.
13. Provide temporary facilities for construction power.

1.03 WORK NOT INCLUDED

- H. Furring for conduit and equipment.
- I. Finish painting of conduit and equipment.
- J. Installation of motors except where specifically noted.
- K. Control wiring for mechanical systems, except where indicated to be provided by Electrical Contractor.
- L. Installation of telephone instruments and wiring.
- M. Flashing of conduits into roofs and outside walls. Inform General Contractor of number and size of roof penetrations prior to bidding.

1.04 RELATED WORK SPECIFIED ELSEWHERE

- N. Classification of excavation: Architectural Division.
- O. Painting: Painting Division.
- P. Concrete Work: Concrete Division.

1.05 REQUIREMENTS OF REGULATORY AGENCIES

- Q. Obtain and pay for all permits required for the work. Comply with all ordinances pertaining to work described herein.
- R. Install work under this Division per drawings, specifications, latest edition of the National Electrical Code, Local Building Codes, and any special codes having jurisdiction over specific portions within complete installation. In event of conflict, install work per most stringent code requirements determined by Architect.
- S. Arrange, pay fees for and complete work to pass required tests by agencies having authority over work. Deliver to Architect Certificates of Inspection and approval issued by authorities.

1.06 QUALIFICATIONS OF CONTRACTOR

- T. Has completed minimum two projects same size and scope in past five (5) years.
- U. This qualification applies to Sub-Contractors.
- V. Use workmen experienced in their respective trade.

1.07 GENERAL JOB REQUIREMENTS

W. Drawings and Specifications:

1. Electrical work is shown on "E" series drawings inclusive. Follow any supplementary drawings as though listed above.
2. Drawings and specifications are complementary. Work called for by one is binding as if called for by both.
3. Drawings show general run of circuits and approximate location of equipment. Right is reserved to change location of equipment and devices, and routing of conduits to a reasonable extent, without extra cost to Owner.
4. Refer conflicts between drawings and specifications describing electrical work and work under other Divisions to Architect for remedial action.
5. Use dimensions in figures in preference to scaled dimensions. Do not scale drawings for exact sizes or locations.
6. Execution of Contract is evidence that Contractor has examined existing conditions, and all drawings and specifications related to work, and is informed to extent and character of work. Later claims for labor and materials required due to difficulties encountered, which could have been foreseen had examination been made, will not be recognized.
7. Charges for extra work not allowed unless work authorized by written order from Architect approving charge for work.

X. Visit to Site:

1. Visit site to survey existing conditions affecting work. Include necessary materials and labor to accomplish the electrical work, including relocation of existing services and utilities on building site in bid. No consideration given to future claims due to existing conditions.

Y. Definitions:

- | | | |
|----|----------|--|
| 1. | Provide: | Furnish, install and connect complete. |
| 2. | Wire: | Furnish all necessary wiring and connect complete. |
| 3. | Install: | Set in place and wire complete. |
| 4. | Work: | Materials completely installed and connected. |
| 5. | AWG: | American Wire Gage. |
| 6. | NEC: | National Electrical Code (latest edition) |
| 7. | NFPA: | National Fire Protection Association. |
| 8. | OSHA: | Occupation Safety and Health Administration. |

- 9. UL: Underwriters Laboratories, Inc.
- 10. NEMA: National Electrical Manufacturers Association.
- 11. IEEE: Institute of Electrical and Electronic Engineers.

Z. Workmanship, Guarantee and Approval:

- 1. Work under this Division shall be first class with emphasis on neatness and workmanship.
- 2. Install work using competent mechanics, under supervision of foreman, all duly certified by local authorities. Installation subject to Architect's constant observation, final approval, and acceptance. Architect may reject unsuitable work.
- 3. Furnish Architect written guarantee, stating that if workmanship and/or material executed under this Division is proven defective within one (1) year after final acceptance, such defects and other work damaged will be repaired and/or replaced.
- 4. In event that project is occupied or systems placed in operation in several phases at Owner's request, guarantee will begin on date each system or item of equipment is accepted by Owner.

AA. Observations of Work and Demonstration of Operation:

- 1. At all observations of work, open panel covers, junction box covers, pull box covers, device covers, and other equipment with removable plates for check. Provide sufficient personnel to expedite cover removal and replacement.
- 2. Contractor to assist Architect in demonstration of operation of new systems to satisfaction of Owner. Contractor to have manufacturer available for demonstration of systems where requested by Owner.

BB. Testing of Electrical Systems:

- 1. Test Completed work as follows:
 - a. Perform test required by Architect to indicate compliance with specifications, drawings and applicable codes. Provide instruments, labor and materials for tests.
 - b. Insulation - use 1000 VDC insulation tester (0-500 megohm full-scale), equal to "Megger" as manufactured by Biddle Company. Test conductors and busses of all systems, including feeders, main service busway, branches, motors, devices, equipment, etc. Test branches for one (1) minute; test feeders, bus ducts, busses, etc., for 15 minutes with readings at one minute intervals.
 - c. Receptacles:
 - (1) Use Woodhead Ground Loop Impedance Tester. Test each receptacle. Record readings.

2. Ground Testing:
 - a. Testing of Made Ground Electrodes:
 - (1) Test Ground Systems Indicated.
 - (2) Using a measuring device which generates minimum of 500 VDC, calibrated in ohms (maximum 200 ohm scale) J.C. Biddle "Vibrotester" or approved equivalent.
 - (3) Provide test electrode in accordance with Measuring Device Manufacturer's instructions. Use ground rods as specified in Section "Grounding".
 - (4) Follow instructions of measuring device manufacturer for proper results.
 - (5) Test grounds only when earth is dry.
 - (6) Record ambient temperature, date, time, approximate water table level (as obtained from local geologists); type of earth material.
 3. Test interval - 15 minutes. Graph microampere leakage vs. time with values plotted each 30-60 seconds. Test to be discontinued if erratic results are observed. Test records include date, ambient temperature, relative humidity, and time of day.
 4. Record all test results in loose leaf log for Owner. Test information required: Date of test; name of circuit or equipment; ambient temperature; weather conditions; final instrument readings; graph of readings for 15 minutes tests. Provide three copies of log.
 5. Architect will observe tests. One week prior notice required.

CC. Materials and Substitutions:

1. All material shall be new, with U.L. label where available. If U.L. label is not available, material shall be manufactured in accordance with applicable NEMA; IEEE and Federal Standards.
2. No material shall be substituted for specified, except by prior written approval of Architect. Specified catalog numbers are used for description of equipment and standard of quality only. Equivalent material given consideration only if adequate comparison data including samples are provided. Approval required prior to bid date. Bid substituted material only if approved in writing by Architect.
3. Submit to Architect within 30 days after award of contract a complete list of proposed material manufacturers. List does not preclude submission of shop drawings. Approval of manufacturer on list does not constitute approval of specific material or equipment.

DD. Shop and Erection Drawings:

1. Submit complete shop drawings for all material and equipment furnished under Division 16 of specifications, to Architect for review within (30) days after award of contract. Shop drawings shall be submitted on timely basis to allow adequate lead time for review, re-submission if necessary, manufacture and delivery to allow access of material to project at correct time based on schedule established by Architect/Contractor. Include complete descriptive data with dimensions, operating data and weight for each item of equipment. Carefully examine shop drawings to assure compliance with drawings and specifications prior to submittal to Architect. Shop drawings and submittals shall bear the stamp of approval of the Electrical and General Contractor as evidence drawings have been checked by them. Drawing submitted without this stamp of approval will not be considered and will be returned for proper resubmission.
2. Drawings larger than 8-1/2" x 11", submit 3 copies and 1 reproducible of each drawing. Architect will retain 2 copies and return 1 reproducible and 1 copy to Contractor. Contractor is responsible for copying reproducible for distribution.
3. 8-1/2" x 11" drawing in brochure: Submit 6 original copies for review Architect will retain 2 copies and return 4 copies to Contractor.
4. Review of shop drawings does not relieve Contractor of responsibility for errors and omissions in shop drawings. Contractor is responsible for dimensions and sizes of equipment. Inform Architect in writing of equipment differing from that shown.
5. Prepare erection drawings when required by Architect. Investigate thoroughly all conditions affecting work and indicate on drawing. Architect will review erection drawings before work commences.
6. Provide for Owner one (1) set of final shop and erection drawings, except provide 1 set of 1.5 mil Mylar sepias of shop drawings larger than 8-1/2" x 11" size.
7. Coordination shop drawings will be required for the following areas, drawn to a scale of not smaller than 1/4" - 1'-0":
 - a. Electrical equipment rooms and areas.
 - b. Electrical and mechanical equipment areas.
 - c. Start drawings as HVAC shop drawings indicating all ductwork piping, equipment and locations of mechanical room floor drains, and electrical connections. Indicate elevations of all ductwork and piping. Draw sections as required to clarify congested situations.
 - d. Next, the Plumbing Section shall add all piping and plumbing equipment to the drawings.
 - e. Next, the Fire Protection Section shall add all sprinkler heads and fire protection piping.
 - f. Next, the Electrical Sections shall add all electrical fixtures, conduit and equipment.

- g. Next, the drawings shall be submitted to the General Contractor for final coordination.
- h. Finally, after the General Contractor has approved the drawings they shall be submitted to the Architect for approval.

EE. Cooperation:

- 1. Carefully coordinate work with other contractors. Refer conflicts between trades to Architect.
- 2. Work to be installed as progress of project will allow. Schedule of work determined by General Contractor and/or Architect.

FF. Maintenance and Operating Instructions for Equipment:

- 1. Submit to Architect one (1) set of data prepared by manufacturer for each item of electrical equipment completely describing equipment. Data to include parts lists, description of operation, shop drawings, wiring diagrams, maintenance procedures and other literature required for maintenance of equipment. Bind in booklet form for presentation.

GG. "Record" Revit model:

- 1. Provide "Record" Revit drawings at the completion of job. Keep set of prints on job and record day to day changes to Contract drawings with red pencil. PDF drawings and Revit model will be furnished Contractor for record drawings. Indicate actual location of conduit systems, outlets, and equipment. Turn over electrical Revit model to Architect after final observation and corrections.
- 2. After receipt of Revit model, contractor shall make (and pay for) auto-positive reproductions of riser diagram. Reduce Riser Diagram to 1/2 size.
- 3. Frame "Record" auto-positives under glass in extruded aluminum frame and mount with screws and inserts on wall. Mount Riser Diagram near Main Switchboard.

Items for Owner:

- 4. Provide following items for Owner at time of substantial completion:
 - a. Certificates of inspection and approval from authorities having jurisdiction.
 - b. Written guarantees.
 - c. "Record" prints.
 - d. Final approved shop drawings (1 set).
 - e. Spare fuses (furnish receipt).

- f. Maintenance data (1 set).
- g. Affidavit of Owner Instruction (1 copy).

HH. Marking:

1. Identify each starter, (including starters furnished under Mechanical Section), panelboard, cabinet, control device, breaker, disconnect and safety switch with 1/4" high black letters cut in a white laminated phenolic strip. Use red letters for all equipment connected to emergency system. Attach to enclosure with two (2) metal screws.
2. Identify receptacle outlets in critical care areas with nameplates indicating circuit number and panel designation. Critical care areas include: Operating Rooms, Delivery Rooms, Intensive Care Units, Special Procedures Rooms, Emergency Trauma and Treatment Rooms. Plates shall be engraved with black fill. Outlets for emergency shall be similarly engraved in red.
3. Nameplates required for other items in this Division similar to those described above.

II. Protection and Storage:

1. Provide warning lights, bracing, shoring, rails, guards and covers necessary to prevent damage or injury.
2. Do not leave exposed or unprotected, electrical items carrying current. Protect personnel from exposure to contact with electricity.
3. Protect work and materials from damage by weather, entrance of water or dirt. Cap conduit during installation.
4. Avoid damage to materials and equipment in place. Repair, or remove and replace damaged work and materials.
5. Exercise particular care when working around telephone (electronic) equipment to prevent entrance of dust, moisture and debris into the equipment. Provide dust barriers and partitions as required.
6. Deliver equipment and materials to job site in original, unopened, labeled container. Store to prevent damage and injury. Store ferrous materials to prevent rusting. Store finished materials and equipment to prevent staining and discoloring. Store materials affected by condensation in warm dry areas. Provide heaters. Storage space on site and in building designated by Owner/Architect.
7. Install equipment per manufacturer's recommendations. Conflicts between contract documents and these recommendations, deferred to Architect.

JJ. Excavation and Backfill:

1. Excavate for work in this Division.
2. Avoid existing facilities in excavating. Contractor is responsible for repair and

replacement of damaged facilities in executing work.

3. Backfill in twelve inch (12") lifts, wetted down and tamped. Compaction minimum 95% of adjacent earth.
4. Repairing to be comparable to work cut including new asphalt paving, concrete paving, sod, replanting shrubbery, etc. Architect will observe repair work, and reject unsuitable work.

KK. Cutting and Repairing:

1. Cut and repair walls, floors, roof, etc., required to install work. Where work cut is finished, employ original installer of finish to repair finish. Do not cut structural members.

LL. Anchors:

1. Provide anchors for all equipment, raceways, hangers, etc. to safely support weight of item involved. Anchors to consist of expansion type devices similar to "Redhead" or lead expansion anchors. Plastic anchors are not acceptable. Protect telephone equipment from drilling residue.

MM. Cleaning and Painting:

1. Clean equipment furnished in this Division after completion of work.
2. Touch-up or re-paint damaged painted finishes.
3. Remove debris, packing cartons, scrap, etc., from site.

NN. Starters:

1. Separately mounted starters are furnished under another Division, but installed in Division 16 unless specifically noted otherwise.

OO. Control Wiring:

1. Control Wiring including low voltage and line voltage interlock wiring will be furnished and installed under another Division, except where specifically shown otherwise. Carefully coordinate power and control wiring interface.

PP. Code Compliance:

1. Entire electrical installation shall comply with all aspects of code including local interpretations. This includes but is not limited to:
 - a. Installation adjustment to meet all code clearances between electrical such as ductwork, other HVAC, plumbing, fire protection, and structural systems.
 - b. Locations for items such as fire alarm appliances, exit lights, egress lighting,

disconnect switches, etc.

2. No additional compensation will be allowed for code compliance. Notify engineer of difficulty encountered for assistance.

END OF SECTION 26 0500

SECTION 26 0502 - ELECTRICAL SUBMITTALS**PART 1 – GENERAL****1.01 DESCRIPTION OF SUBMITTAL CATEGORIES**

- A. Submittals required are defined below and specified in each section. Refer to Section 01300.
- B. Shop Drawings include fabrication, layout, wiring diagrams, erection, setting, coordination, similar drawings and diagrams and performance data.
- C. Samples are units of work, materials or equipment items, showing the workmanship, pattern, trim and similar qualities proposed.
- D. Manufacturer's Data is standard printed product information concerning the standard portions of the manufacturer's products.
- E. Certifications are written statements, executed specifically for the project application by an authorized officer of the contracting firm, manufacturer or other firm as designated, certifying to compliance with the specified requirements.
- F. Test Reports are specific reports prepared by independent testing laboratories, showing the results of specified testing. Industry Standards are printed copies of the current standards in the industry.
- G. Manufacturer's Product Warranties are manufacturer's standard printed commitment in reference to a specific product and normal application, stating that certain acts of restitution will be performed by the manufacturer if the product fails under certain conditions and times limits.
- H. Operating Instructions are the written instructions by the manufacturer, fabricator or installer of equipment or systems, detailing the procedures to be followed by the Owner in operation, control and shut-down.
- I. Maintenance Manuals are the compiled information provided for the Owner's maintenance of each system of operating equipment. Maintenance Materials are extra stock of parts or materials for the Owner's initial use in maintaining the equipment and systems in operation.
- J. Guarantees are signed commitments to the Owner that certain acts of restitution will be performed if certain portions of work fail within certain conditions and time limits.
- K. Product Data includes manufacturer's data pertaining to the products, materials and equipment of the work.

1.02 SUBMITTAL FORM AND PROCEDURES

- L. Submittals shall be made within 30 days of contract signing for projects of 12 months construction time or less. Make within 60 days for longer than 12 months construction time.
- M. Submit shop drawings for all material and equipment furnished under Division 16 to Architect. Refer to Section 01300 get from Architect for submittal procedures.

- N. Multiple System Items: Where a required submittal relates to an operational item of equipment used in more than one system, increase the number of copies as necessary to complete maintenance manuals for each system.
- O. Response to Submittals: Submittals will be returned with indication that documents comply with specifications or that documents do not comply and what action must be taken to be in compliance.
- P. Coordinate electrical submittals through Contractor to Architect and assist Contractor in preparation of submittal.
- Q. Submittals shall bear the stamp and signature of electrical and general contractor. Failure to place same on drawings require resubmittal before review.

1.03 SPECIFIC SUBMITTAL REQUIREMENTS

- R. Shop Drawings:
 - 1. To accurate scale except where diagrammatic representations are specifically indicated.
 - 2. To show clearance dimensions of critical locations and show dimensions of spaces required for operation and maintenance of equipment.
 - 3. To show conduit and conductor connections and other service connections.
 - 4. To show interfaces with other work including structural support.
 - 5. To include complete descriptive data, with dimensions, operating data and weight.
 - 6. To indicate deviation from the contract documents.
 - 7. To explain deviations.
 - 8. To show how deviations coordinate with portions of the work, currently or previously submitted.
- S. Review of shop drawings shall not relieve Contractor of responsibility for errors or omissions in shop drawings. Any equipment which will not fit into space shown on drawings shall be called to the attention of the Architect in writing.
- T. Samples: Architect's review of sample submittals:
 - 1. Limited to general type, pattern and finish.
 - 2. Not to include testing and inspection of the submitted samples.
 - 3. Compliance with specified requirements is exclusive responsibility of the Contractor.
- U. Manufacturer's Data:
 - 1. Where pre-printed data covers more than one distinct item, mark copy to indicate

- which item is to be provided.
2. Delete portions of data not applicable.
 3. Mark data showing portion of operating range required for project application.
 4. Elaboration of standard data describing a non-standard product processed as a shop drawing.
- V. For each product include:
1. Manufacturer's production specifications.
 2. Installation or fabrication instructions.
 3. Source of supply.
 4. Sizes, weights, speeds and operating capacities.
 5. Conduit and wire connection sizes and locations.
 6. Statements of compliance with required standard and governing regulations.
 7. Performance data, where applicable.
 8. Other information needed to confirm compliance. Manufacturer's recommended parts list.
- W. Certifications: Submit with notarized execution.
- X. Test Reports: Submit notarized test reports signed and dated by firm performing test.
- Y. Manufacturer's Product Warranties: Where published warranty includes deviation from required warranty, product is disqualified from use on project, unless manufacturer issues a specific project warranty.
- Z. Operating Instructions submittal required:
1. Manufacturer's operating instructions for each item of electrical equipment.
 2. Supplement with additional project application instructions where necessary.
 3. Specific operating instructions for each electrical system which involves multiple items of equipment. Instructions for charging, start-up, control or sequencing of operation, phase or seasonal variations, shut-down, safety and similar operations.
 4. Typewritten in completely explained and easily understood English language.
- AA. Maintenance Manual Requirements:

1. Emergency instructions including addresses and telephone numbers for service sources.
 2. Regular system maintenance procedures.
 3. Proper use of tools and accessories.
 4. Wiring and control diagram for each system.
 5. Manufacturer's data for each operational item in each system.
 6. Manufacturer's product warranties and guarantees relating to the system and equipment items in the system.
 7. Shop drawings relating to the system.
 8. Bind each maintenance manual in one or more vinyl-covered, 2", 3-ring binders, plus pocket-folders for folded drawings. Index with thumb tab for sections. Mark the back spine and front cover of each binder with system identification and volume number.
- BB. Maintenance Materials: Deliver to Owner in fully identified containers or packages suitable for storage.
- CC. Guarantees: Where indicated as "Certified", provide guarantee which, in addition to execution by an authorized officer of each guarantor, is attested to by the Secretary of each guarantor and bears the corporate seal. Submit draft of each guarantee prior to execution.

END OF SECTION 26 0502

**SECTION 26 0504– COORDINATION
PART 1 - GENERAL**

1.01 DRAWINGS FOR MECHANICAL, PLUMBING, FIRE PROTECTION AND ELECTRICAL WORK

- A. Drawings contain diagrammatic layouts and indicate general arrangement of systems, piping conduit, etc.
- B. Prior to installation of material and equipment, review and coordinate work with Architectural and Structural Drawings and other Division work for exact space conditions; where not readily discernable request information from Architect before proceeding.
- C. Check Drawings of all other trades to verify extent of material and equipment to be installed in spaces available and consider layout alternatives so that all requirements can be accommodated.
- D. Maintain maximum headroom at all locations without finished ceilings.
- E. Maintain finished ceiling heights as indicated on Architectural reflected ceiling plans, and building sections and elevation drawings.
- F. Coordinate installations with other trades prior to proceeding to prevent conflict with work of other trades and cooperate in making reasonable modifications in layout as needed.
- G. Where conflicts occur with placement of mechanical and electrical materials as they relate to placement of other building materials, the Architect shall be consulted for assistance in coordination of the available space to accommodate all trades.
- H. Coordinate equipment installation to maintain manufacturer and code required working clearances.

1.02 PRIORITY OF CONSTRUCTION SPACE

- I. Following is the Order of Priority for Construction Space:
 - 1. First: Ductwork.
 - 2. Second: Fire protection piping.
 - 3. Third: Other piping.
 - 4. Fourth: Conduit.

1.03 COORDINATION DRAWINGS

- J. The Contractor shall prepare a complete set of "Cronoflex Mylar" type background drawings at scale of minimum 1/4" equals 1'-0".
 - 1. The construction documents in their original, copies or electronic file form are the Architect's instrument of service and are protected under copyright laws. The reproduction of these documents for use as coordination drawings or shop drawings is prohibited without the Architect's written consent and authorization.
- K. Each specialty trade listed below shall prepare a coordination Mylar overlay indicating his work, with appropriate elevations and grid dimensions.

- L. Each specialty trade shall sign and date the coordination Drawing after the addition of his information.
- M. Fabrication shall not start until receipt of completed coordination drawings is acknowledged by the Contractor in writing to the Architect.
- N. Specialty Trades:
 - 1. Ductwork
 - 2. Fire protection piping
 - 3. Other piping
 - 4. Electrical
 - 5. Plumbing piping to include but not limited to sanitary, vent, pressure storm, medical gas (if provided), compressed air, natural gas, etc.
- O. Coordination Drawings required for all mechanical rooms, electrical rooms, equipment rooms, corridors, horizontal exits from duct shafts, cross-overs and any other areas where congestion of work may occur.
- P. Coordination Schedule Drawing:
 - 1. The mechanical and plumbing contractor shall furnish to electrical contractor for coordination a schedule drawing providing all the electrical characteristics of all mechanical and plumbing equipment requiring electrical connection. The information provided shall include:
 - a. Unit Designation
 - b. Voltage
 - c. MCA
 - d. MOCP/MFS
 - e. FLA
 - f. Disconnect Requirement
 - g. Starter Requirement
 - h. Alarm Wiring Requirements
 - 2. The coordination schedule drawing, once received by the electrical contractor, shall be reviewed and all pertinent electrical accommodations indicated.
 - a. Breaker size.
 - b. Wire size / conduit size.
 - c. Disconnect with fuse size.
 - 3. Once the coordination schedule is completed forward to the engineers for review and approval.
- Q. Conflicts that arise due to the fact that the coordination schedule drawing was not completed

shall be the sole responsibility of the contractors. All costs for correction or remedial work shall be done at the contractor's expense. No added cost to the owner will be allowed.

END OF SECTION 26 0504

- L. Conform to applicable code for fire resistance ratings and surface burning characteristics.
- M. Provide certificate of compliance from authority having jurisdiction indicating approval.
- N. Provide mock-up of applied firestopping material for each type of application.
- O. If accepted, mock-up will demonstrate minimum standard for the work.
- P. Mock-up may remain as part of the work.
- Q. Do not apply materials when temperature of substrate material and ambient air is below 40 degrees F.
- R. Maintain this minimum temperature before, during, and for 3 days after installation of materials.
- S. Provide ventilation in areas to receive solvent cured materials. Use water based materials in occupied areas.
- T. Sequence work to permit firestopping materials to be installed after and surrounding work is complete.

1.06 DELIVERY, STORAGE, AND HANDLING:

- U. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, grade, and UL label where applicable.
- V. Coordinate delivery with scheduled installation date to allow minimum storage time at site.
- W. Store materials in clean, dry, ventilated location. Protect from soiling, abuse, and moisture. Follow manufacturer's instructions.

1.07 GUARANTEE:

- X. Submit copies of written guarantee agreeing to repair or replace joint sealers which fail in adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability or appear or deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated. The guarantee period shall be one year from date of substantial completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. 3M brand CP25 Fire Barrier Caulk, CS195 Composite Sheet, FS195 Wrap/Strip, RC-1 Restricting Collars, Interim Fire Dam 150 caulk or moldable putty. Other approved manufacturers are GE "Pensil" Systems and Dow Corning Fire Stop Systems.
- B. Primer: Type recommended by firestopping manufacturer for specified substrate surfaces.

2.02 ACCESSORIES

- C. Dam Materials: Mineral fiberboard, mineral fiber matting, sheet metal or alumina silicate fire board.

PART 3 - EXECUTION

3.01 GENERAL

- A. Verify site conditions.
- B. Verify that openings are ready to receive the Work of this Section.

3.02 PREPARATION

- C. Clean substrate surfaces of dirt, dust, grease, oil, loose materials or other matter which may affect bond of firestopping material.
- D. Remove incompatible materials which affect bond.

3.03 INSTALLATION

- E. Install penetration seal materials in accordance with printed instructions of the UL Fire Resistance Directory and in accordance with manufacturer's instruction.
- F. Seal holes or voids made by penetrations to ensure an effective smoke barrier.
- G. Where floor openings without penetrating items are more than four inches in width and subject to traffic or loading, install fire stopping materials capable of supporting same loading as floor.
- H. Protect materials from damage on surfaces subject to traffic.
- I. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.
- J. Keep areas of work accessible until inspection by applicable code authorities.
- K. Perform under this section patching and repairing of fire stopping caused by cutting or penetration by other trades
- L. Install backing materials to arrest liquid material leakage.

3.04 APPLICATION

- M. Apply materials in accordance with manufacturer's instructions.
- N. Apply firestopping material in sufficient thickness to achieve rating to uniform density and texture.
- O. Install material at floors, walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit and other items requiring firestopping.

3.05 CLEANING

- P. Clean up spills of liquid components.
- Q. Neatly cut and trim materials as required.
- R. Remove equipment, materials and debris, leaving area in undamaged, clean condition.
- S. Protect finished work.
- T. Protect adjacent surfaces from damage by material installation.

3.06 SYSTEMS AND APPLICATION SCHEDULE:

<u>Construction Condition</u>	<u>UL Designation</u>
Metal Pipe or Conduit	C-AJ-1001, C-AJ-1007, C-AJ-1027, C-AJ-1044
Through Round Opening	W-J-1010
Metal Pipes or Conduits	C-AJ-1001, C-AJ-1006, C-BJ-1020, C-BJ-3017,
Through Large Opening	C-AJ-1044, W-J-1010
Busway Through Rectangular	F-A-6001, C-AJ-6001
Cables Through Opening	C-AJ-3021, C-AJ-3030
Cable Tray	C-AJ-4003
Blank Opening	C-AJ-0004, C-AJ-0009
Non-metallic (Plastic) Pipe or Conduit Through Opening	C-AJ-2001
Metal Pipe or Conduit Through Gypsum Board Wall	W-L-1001, W-L-1016
Non-Metallic (Plastic) Pipe or Conduit Through Gypsum Board Wall	W-L-2002
Cables Through Gypsum Board Wall	W-L-3001
Metal Pipe or Conduit Through Wood Construction	F-C-1002
Non-Metallic (Plastic) Pipe or Conduit Through Wood Construction	F-C-2002

Cables Through Wood Construction F-C-3001

- U. The following sections have applications for fire ratings less than 2-hours: C-AJ-2001, C-AJ-5001, WL-L-1001, W-L-2002.
- V. The following sections have applications for fire ratings of 4-hours: C-AJ-5001, C-AJ-1007, C-BJ-1020, and C-BJ-3017
- W. All sections (including those previously listed) listed have applications for fire ratings of 2-hours or less.

END OF SECTION 26 0505

SECTION 26 0519 - CONDUCTORS (Low Voltage, 600 Volts)

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Furnishing, installing and testing 600 volt conductors for lighting, power, and auxiliary systems.

PART 2 - PRODUCTS

2.01 CONDUCTORS

- A. 98% conductivity copper; #12 AWG minimum; #10 AWG and smaller solid, #8 and larger stranded.
- B. Conductors furnished with NEC, 600 volt, insulation as follows:
 - 1. Dry locations:
 - a. # 6 AWG and smaller]: type THW, THWN or XHHW (do not intermix in circuits)
 - b. # 4 AWG and larger: type RHH-RHW-USE, (cross linked polyethylene)
 - 2. Wet locations: type RHH-RHW-USE
- C. Wiring for controls and auxiliary systems #14 AWG minimum with NEC type THWN insulation.
- D. Luminaire Wire: Incandescent - Use type SF-2, #16 for luminaires up to 300 watts, and #14 over 300 watts, except for luminaires in concrete pour use #12 or larger or as shown. Conductors in channels of, and flex to fluorescent luminaires type THHN or XHHW.
- E. Ungrounded System Wiring: All wiring connected to the secondary side of isolating transformers: Cross-linked polyethylene insulation with dielectric constant of less than 3.5; 30 mills minimum thickness, resistance constant greater than 20,000 at 60 degrees F, shall be suitable for wet and dry locations. Cable - G.E. No. SI-58053 or approved equivalent.
- F. Color Code as follows and/or per local ordinances. Conductors #10 and smaller with colored insulation. Conductors #8 and larger not available in colors, color coded with colored pressure sensitive tape. Apply minimum 2" of tape to each individual phase or neutral conductor in half lapped pattern. The equipment ground conductor shall be taped green for its entire exposed length. Color-code as follows:

<u>Phase</u>	<u>120/208 Volts</u>	<u>Ungrounded</u>	<u>Isolated Power 120/208</u>
A	Black	Orange	Black
B	Red	Brown	Red
C	Blue	Yellow	Blue

Neutral	White	White	White
Eq Grnd	Green	Green	Green
Iso Grd			Green / Black Stripe

- G. Manufacturers of copper conductors: Phelps Dodge, Capital Cable, Southwire, Senator, United Copper, Cero Wire & Cable, American, or approved equal.

PART 3 - EXECUTION

- A. Install wiring complete with connections to equipment.
- B. No wiring installed until after plastering and similar work is complete and dry.
- C. Install wiring so conductors are not in tension in completed system.
- D. Form wiring neatly and group in circuits. Tie grouped conductors with nylon ties, T&B "Tyrap" or approved equal.
- E. Use pulling compound of Ideal "Yellow 77", Minerallac No. 100, or approved equal. Do not use pulling compound for circuits on secondary side of ungrounded isolation transformers.
- F. Join and terminate copper conductors individually.
1. Lugs in damp locations connected to copper bus: 98% conductivity copper or bronze Thomas & Betts "Locktite", Burndy "QA" or approved equivalent.
 2. Lugs in dry locations and lugs connected to aluminum bus - heavy casting aluminum, CU/AL rated, listed under UL Standard 486B, rated 90 degrees C; plated to prevent electrolysis, Thomas & Betts, Blackburn, IlSCO or approved equivalent.
- G. Provide lugs where not furnished as part of equipment - furnish as specified above, to connect all conductors.
- H. Furnish lugs for conductors #2/0 and larger with two bolt tongue or approved equivalent.
- I. Make conductor taps #8 and larger from a second conductor with 98% conductivity bolted insulated connector, T&B "IDT", IlSCO "KUP-L-TAP" or approved equivalent. Insulate splices with 600 volt "heat shrink" covers T&B or equal.
- J. Splice conductors #8 and larger with solid copper barrel, type fittings applied with an appropriate hydraulic tool. Splices used only where approved. Splice fittings: Burndy "Hydent". Insulate splices with 600 volt "heat shrink" covers T&B or equal.
- K. Joints #10 and smaller: T&B Sta-Kon wire joints EPT66M, with insulating caps, installed with WT161 Tool or C nest of WT11M Tool; Ideal Super/Nuts; Ideal Wing Nuts; 3M "Scotchlock" or Buchanan Electric Products B Cap or Series 2000 Pressure connectors complete with nylon snap on insulators installed with C24 pressure tool. Where conductors are connected to screw terminals, use nylon insulated, locking fork, T&B Sta-Kon or approved equal. Where joints are

made in damp or wet locations insulate splices with 600 volt "heat shrink" covers T&B or equal.

- L. Provide cable supports: As required by NEC. Supports with malleable screwed conduit fitting and non-conductive wedges drilled for the conductors; O.Z. Manufacturing Company or approved equal. Furnish pullbox, sized per NEC for each cable support.
- M. Bond circuit ground wires where installed to all devices, equipment, outlet and junction boxes, and grounding bushings (where provided) with a full size conductor and screw type connection.
- N. Securely fasten non-ferrous identifying tapes, pressure sensitive labels or engraved nameplates to all cables, feeders and power circuits in vaults, pull boxes, manholes, switchboard rooms, terminations of cables, etc.
- O. Mark all branch circuit conductors at panel terminations including neutrals with pressure sensitive numbers to correspond to circuit numbers connected.
- P. Connect circuits and feeders as shown on drawings. Drawings are diagrammatic and do not show every detail required in the wiring system. Detail wiring accomplished per NEC.
- Q. All conductors making up parallel feeders to be same size, same type, and same insulation, all cut same length. Bond each group of conductors making up a phase or neutral at both ends in an approved manner.
- R. DO NOT COMBINE CIRCUITS unless specifically approved by the Architect (or) Engineer. No more than 3 phase or current carrying conductors in a circuit.

END OF SECTION 26 0519

SECTION 26 0520 – METAL CLAD CABLE (MC)

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. Furnishing and installing 600 volt conductors for lighting, power, and auxiliary systems in a spiral flexible enclosure designated MC-Cable per applicable NEC Article.
- B. Furnishing and installing metal clad cable (MC) for branch circuit 20 amps in capacity for lighting and power circuits in areas with lay-in ceiling, and in stud walls.
- C. U.L. listed UL 1569 metal clad type MC cable

PART 2 PRODUCTS

2.01 CONDUCTORS

- A. Conductor 98% copper #12 AWG minimum type THHN insulation manufactured and tested in compliance with UL-83; insulation resistance 6-1 megohms per 1000 feet.
- B. Grounding conductors to be same size as phase conductors, and shall be insulated.
- C. Jacket shall be galvanized steel or metal clad aluminum, and shall be applied over the inner cable assembly with a positive interlock armor to wire grounding path in compliance with UL 1569.
- D. Circuit assembly shall be cabled (twisted) with suitable lay length, and covered with durable polyethylene terephthalate assembly tape.
- E. Product shall be as manufactured by Galflex, AFC Cable, Southwire, or approved equal.
- F. Color Code as follows and/or per local ordinances and as follows with colored insulation

<u>Phase</u>	<u>120/208 Volts</u>	<u>277/480 Volts</u>
A	Black	Yellow
B	Red	Orange
C	Blue	Brown
Neutral	White	Gray
Equipment Ground	Green	Green

PART 3 EXECUTION

- A. Install cable only above accessible ceiling and in stud walls. Do not run from floor to floor.
- B. Installation shall be in accordance with applicable NEC Article. Support cable on 5-foot centers, and not more than 12-inches at box or cabinet. (Support independent of ceiling).
- C. Fittings and connectors shall be products specifically designed for MC cable.
- D. Joints #12 and smaller: T&B Sta-Kon wire joints EPT66M, with insulating caps, installed with WT161 Tool or C nest of WT11M Tool; Ideal Super/Nuts; Ideal Wing Nuts; 3M “Scotchlock” or Buchanan Electric Products B Cap or Series 2000 Pressure connectors complete with nylon snap on insulators installed with C24 pressure tool. Where conductors are connected to screw terminals, use nylon insulated, locking fork, T&B Stan-Kon or approved equal.

- E. Bond circuit ground wires where installed to all devices, equipment, outlet and junction boxes, and grounding bushings (where provided) with a full size conductor and screw type connection.
- F. Securely fasten non-ferrous identifying tapes, pressure sensitive labels or engraved nameplates to all cables, feeders and power circuits in vaults, pull boxes, manholes, switchboard rooms, terminations of cable, etc.
- G. Mark all branch circuit conductors at panel terminations including neutrals with pressure sensitive numbers to correspond to circuit numbers connected.
- H. Connect circuits shown on drawings. Drawings are diagrammatic and do not show every detail required in the wiring system. Detail wiring accomplished per NEC.
- I. Circuiting where drawings do not show circuit conductors provide same as required to provide complete control and connections as designated by circuit numbers.
- J. Install MC cable only above accessible ceilings and on drywall construction. Where conductors must pass thru or in non accessible and exposed area provide circuits in EMT or rigid as required by code.
- K. DO NOT COMBINE CIRCUITS unless specifically approved by the Engineer.

END OF SECTION 26 0520

SECTION 26 0526 – GROUNDING**PART 1 - GENERAL****1.01 SCOPE OF WORK**

- A. Grounding Details

PART 2 - PRODUCTS**2.01 SYSTEM GROUNDING**

- A. Bond and ground main service neutral, cabinets, equipment, conduits, metallic piping systems, etc., per the latest edition of NEC.
- B. Ground conductors - 98% conductivity copper, either bare or with green THW insulation. Other conductor requirements same as described for low voltage, 600 volts, conductors.
- C. Ground Connections:
 - 1. Make with mechanical connectors where accessible and with "Cadweld" or approved equivalent where inaccessible.
 - 2. Use high alloy cast copper and/or silicon bronze mechanical connectors with Hex or Allen head bolts where permitted.
 - 3. Use Burndy "GAR" or approved equivalent.
 - 4. Size as required for piping connections.
 - 5. Thoroughly clean prior to installation of clamps and/or lugs.
 - 6. Use bolted or screwed on mechanical connectors. Do not use clip-on connections.
 - 7. Bond ground conductor to metal raceway at each end of the run.
 - 8. Seal connections between dissimilar metals (i.e.: bronze to steel), with approved epoxy resin.
 - 9. Coat connections with "No-OXID-A" compound as manufactured by Dearborn Chemical Company.
- D. Provide lighting and power circuits with green covered ground wire sized per NEC, or as shown, except not smaller than #12 AWG. Bond ground wire to all outlet boxes, junction and pull boxes, cabinets, equipment, etc., with self-tapping screw or bolt and appropriate lug. See Section covering "Raceways" for use of grounding bushing.

2.02 DRIVEN GROUND SYSTEM

- E. Provide driven ground rods and buried ground conductor interconnecting ground rods as shown

on drawings and required by code.

- F. Ground rods 3/4"x10'-0" copper clad steel, Thompson #558 or approved equal. Ground rods installed with tops driven to 1'-6" minimum below grade. Connect ground wire to ground rod with Thompson #493 "U" bolt bronze clamp.
- G. Exterior buried ground conductor #2/0, soft drawn, bare, tinned copper, installed 2'-0" minimum below grade.
- H. Bond all masses of metal, i.e.: pipes, conduits, fence posts, etc., within 6'-0" of the buried ground conductor to ground conductor with #6 AWG bare, solid, tinned copper wire, attached to object with appropriate clamp, lug, etc.. Obtain complete set of drawings to determine quantity and location of required connections.
- I. All connectors lugs, hardware, etc., for building ground system similar to that for other grounding as described above.

PART 3 - EXECUTION

3.01EQUIPMENT GROUND 'GREEN WIRE CONCEPT'

- A. Ground electrical equipment enclosures and conductor enclosures including metal raceways, outlet boxes, cabinets, switch boxes, motor frames, diesel engine frame, transformer cases, metallic piping systems such as water, gas, waste, air and metallic enclosures for all electrical equipment.
- B. Provide separate grounding conductor for all circuits to insure adequate ground fault return path.
- C. Install separate ground conductors in conduit.
- D. Bond green wire to equipment enclosure at source and at apparatus served.
- E. Insulate grounding conductor size to carry ground fault current safely. Minimum size for green wire grounding lead per N.E.C. or as indicated.
- F. Do not use grounded current return conductors (neutrals) for equipment grounding. Connect common grounding lead to supply side of service disconnect unit only.
- G. Do not ground neutral conductor after it has been grounded at service entrance, transformer or generator.
- H. Maintain electrical continuity of conduit systems by threaded fittings with joints made-up wrench tight. Install insulated bushing and locknuts on terminating conduits. Provide conduits containing ground wires with grounding bushings bonded to ground wire with short full size jumper.
- I. Provide receptacles with approved green covered bonding jumper from the grounding terminal screw connected to outlet box.

- J. Install ground rods in quantity to provide a maximum of 5 ohms ground resistance. Where multiple rods required, separate a minimum of 6 feet and interconnect with wire of ground size shown.
- K. Test ground systems as specified in Section 16010.
- L. Install tags on ground connections to piping or electrode systems for all telephone equipment grounds.

END OF SECTION 26 0526

SECTION 26 0528 - TELEPHONE SYSTEM

PART 1 - GENERAL

1.01SCOPE OF WORK

- A. Telephone system consist of empty conduits, raceways, boxes, outlets, and terminal boards.

PART 2 – PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.01TELEPHONE ENTRANCE

- A. Install entrance conduits as shown on drawings.

3.02 EMPTY CONDUIT

- B. Interior conduit EMT, minimum 3/4" unless noted otherwise. 2" size and larger - use screw indenter type fittings.
- C. Conduit homeruns - minimum 1" unless otherwise noted.
- D. Conduit to extend from wall and floor outlets and terminate with a bushing at cable tray.
- E. All conduit shall have #14 iron fish wire or nylon pull cord.

3.03 TERMINAL BACKBOARD

- F. Terminal backboard constructed of high density, commercial grade pressboard, securely fastened to wall. Entire assembly painted with two coats of blue paint.

3.04OUTLETS

- G. Provide outlets with blank device plate, except where telephone terminal is installed.

END OF SECTION 26 0528

SECTION 26 0533 – RACEWAYS**PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Installation of raceway systems for all work in Division 16 and required fittings.

PART 2 - PRODUCTS**2.01 ACCEPTABLE MANUFACTURERS**

- A. Metallic Raceways:
1. Republic
 2. Wheatland
 3. Allied
 4. Clifton
 5. Triangle
 6. Walker
 7. Western
 8. AFC
- B. Non-Metallic Raceways
1. Carlon
 2. National Pipe & plastics
 3. Can-Tex
 4. Allied
- C. Fittings
1. Thomas & Betts
 2. Hubbell: RACO; Killark
 3. Appleton
 4. Midwest
 5. EFCOR
 6. OZ Gedney
 7. Bridgeport
 8. AFC

2.02 RACEWAYS

- A. Rigid galvanized steel conduit to conform to ASA Standard C80.1 and U.L. Standard No. 6 for rigid metallic conduit, except hot dipped galvanized after threading.
1. Fittings, ells, couplings, etc., galvanized threaded type meeting above standards. Threadless fittings not allowed.
 2. Terminate rigid conduit with two locknuts, one inside, one outside of the cabinet, junction or outlet and a bushing. Bushing - malleable iron with smooth bakelite ring molded into edge of bushing to prevent damage to cable, OZ Mfg. Co., type "B" or

approved equal. Where grounding bushings are required, construction of bushing similar to above except a lug provided for grounding connection, OZ type "BLG" or approved equal.

- B. Rigid intermediate grade conduit, IMC, to conform to UL Standard No.1242; hot dipped galvanized or approved equivalent.
 - 1. All fittings, ells, couplings, etc., constructed to same standards as rigid steel conduit. Fittings - threaded type with all threads engaged. Use "Uni-swivel" couplings in dry locations only.
 - 2. Conduit terminations same as rigid steel conduit.
- C. Flexible steel conduit, "Greenfield", continuous spirally wound and inter-locked, threadless, galvanized conforming to U.L. and CSA Standards for flexible steel conduit.
 - 1. Connectors and fittings galvanized steel, threadless type with insulated throats, U.L. approved for grounding means.
- D. Liquid tight flexible steel conduit constructed similar to flexible steel conduit above, except with polyvinyl chloride jacket.
 - 1. Fitting Assembly - sealing type, with steel gland, nylon ring and ground cone inside locknut. All fittings with insulated throat, U.L. approved for grounding means.
- E. Electrical metallic tubing, EMT, threadless, steel type conforming to ASA Standard C80.3 galvanized inside and out, and with additional corrosion resistant finish.
 - 1. Fittings, connectors, couplings, etc., insulated throat galvanized steel screw indenter.
- F. Plastic conduit, PVC, polyvinyl chloride compound, rated for direct burial, Schedule 40, except as noted otherwise.
 - 1. Fittings same material as conduit and installed with watertight joint compound recommended by manufacturer.
- G. Type EB - encased burial duct: Polyvinyl chloride compound conforming to NEMA Standard TC-6, UL listed and designed for encased burial use.
 - 1. Fittings same material as conduit and installed with watertight joint compound recommended by manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install conduit as follows:
 - 1. Use rigid steel or intermediate grade conduit for:
 - a. Circuits run underground.

- b. Circuits run in concrete in contact with earth.
- c. Circuits in hazardous and wet locations.
- d. Circuits exposed to mechanical damage.
- e. All feeders (1-1/4" diameter and larger).
- f. All motor circuits.

2. Use electrical metallic tubing, EMT, for:

- a. Branch circuits (conduit 1" diameter and smaller) in dry locations.
- b. Telephone circuits.
- c. Auxiliary systems and controls (low voltage systems such as fire alarm nurse call sound systems, etc).
- d. Feeders run overhead in dry locations.
- e. Branch circuits in concrete slab (above slab on grade).

3. Use PVC conduit for:

- a. Circuits run underground where indicated.
- b. For branch circuits in concrete slab.
- c. Where specifically shown on drawings.
- d. No PVC shall be exposed.

Note: Do not use PVC in Patient Care Areas.

4. Use type EB conduit for exterior concrete encased application where shown.

- B. Size conduit per NEC. Minimum size 1/2" diameter, but no more than 3#12 installed in 1/2" conduit.
- C. Run conduit concealed where possible. Run concealed conduit above furred ceiling in an orderly manner. Multiple conduits grouped and run parallel.
- D. In concrete slab: Install conduits in center of concrete slabs and tie to reinforcing steel with tie wires. Do not install conduit larger than 1" in concrete slabs unless approved by Architect. Install with minimum of 2" between parallel runs. Do not cross conduits in slab unless necessary, then only one conduit crossover in 12" space.
- E. Exposed Conduit: Use only where specifically shown or approved. Run perpendicular to building walls and partitions and tight against structure. Conceal vertical portion of conduits where possible.
- F. Paint underground metal conduit with 2 coats of asphaltum or bituminous. Make underground conduit fittings watertight using Teflon tape. Do not use split couplings and similar fittings underground and exposed to moisture. Run underground conduits minimum 24" below grade. Do not run conduit in slag fill.

- G. Paint conduit fittings and threads exposed to moisture with Rustoleum silver paint after installation.
- H. Furnish offsets required to meet field conditions. Make bends in conduit in accordance with the National Electrical Code, except make minimum radius of 6 times conduit diameter or 6" whichever is greater. Bend IMC conduit without deforming.
- I. Where conduit crosses expansion joints, install expansion type fittings OZ type EX with bonding jumper or approved equal.
- J. Make connections to equipment away from wall with conduit extensions exposed from ceiling to floor, anchored with floor flange and/or angle frame as required. Make connections to equipment with flexible conduit from tee conduit in conduit riser.
- K. Vibrating equipment and equipment requiring adjustment, i.e.: motors, transformers, etc: make final connections with flexible conduit.
- L. Isolate conduit connections to equipment on roof from roof penetration of conduit with short section of flexible conduit between roof penetration and equipment.
- M. Use liquidtight flexible conduit where exposed to moisture, oil, etc.
- N. Install conduit to avoid hot water pipes. Maintain 9" clearance of such pipes, unless closer crossings are unavoidable. Maintain minimum 1" clearance from covering of pipe crossed.
- O. Support conduit per NEC. Support individual conduits with galvanized hangers and rods as follows:

1" diameter and smaller	1/4" dia. rod
1-1/4" to 3" diameter	3/8" dia. rod
Larger than 3" diameter	1/2" dia. rod
- P. Individual conduit hangers - Minnerallac, or approved equal. Support EMT near each joint. Support for multiple conduit runs consist of Uni-strut channel as required with 1/2" diameter galvanized bolts or rods anchored to structure. Provide "U" bolt clamps for each conduit on hangers. Support vertical riser conduits with galvanized bolted clamps at each floor. Do not support conduit to ceiling support system.
- Q. Terminate conduits entering sheet metal boxes with double locknuts and bushings. Terminate conduit exposed to moisture with watertight hubs.
- R. Install appropriate seal-off where conduits exit hazardous areas, areas of temperature differential etc.
- S. Where ground conductor installed in conduits 1-1/4" and larger provide grounding bushings, and bond full size ground wire to bushings and from bushing to box or cabinet. Bond with self-tapping screw and appropriate lug. Where ground wires are run in smaller conduits, bond to outlet and junction boxes with self-tapping screw lug. Provide other conduits with non-grounding bushings as described under another article. Provide all service entrance metallic raceways with grounding bushing and bond to ground bus; bond sized per N.E.C..

- T. Conduit work in hazardous areas, or areas with large temperature differential: Use rigid steel or IMC conduit with sealing fittings, poured with hardening compound after conductors are pulled-in. Seals installed per NEC. Conduit seals Crouse-Hinds type EYS or approved equal.
- U. PVC Conduit Installation:
1. Above ground: Allow for expansion and contraction.
 2.Below grade: Encase in 3" sand fill. Backfill free of large rocks and debris.
 3.Make elbows, bends, etc., with heated bender when factory bends are not available.
 - a. When below slab, provide rigid elbows.
 4. Make cuts with hacksaw and deburr ends.
 5. Make joints as follows:
 - a. Clean outside of conduit to depth of socket, and inside of socket with approved cleaner. Apply solvent cement to interior of socket and exterior of conduit, Insert conduit in socket and rotate 1/4 to 1/2 turn and allow to dry.
 6. Where non-metallic conduit is used for power wiring install insulated ground wire, sized per NEC unless shown larger.
- V. Sleeves:
1. Provide sleeves for raceways penetrating floor and structural members. Sleeves consist of Electrical Metallic Tubing set in forms. (Exception: Use Schedule 40 PVC for individual ground conductors).
 2. Size sleeves to allow 1/2" clearance around raceway extending from bottom of floor construction to 2" above floor, minimum sleeve size 2-1/2" diameter. After raceways are installed, seal space between the raceway and sleeve with non-hardening, fireproof, compound, CTC PR-855 sealant, T&B "Flame Safe" for 2 hour fire rating or approved equal.

END OF SECTION 26 0533

SECTION 26 0534- OUTLET BOXES, JUNCTION BOXES AND GUTTERS**PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Outlet, junction boxes, conduit bodies, wiring gutters and their installation.

PART 2 - PRODUCTS**2.01 OUTLET AND JUNCTION BOXES**

- A. Provide wiring devices, fixtures and special system outlets with outlet box. Use galvanized steel for concealed boxes and exposed boxes in dry locations. Use cast iron conduit fittings similar to "Condulets" or "Unilets" with threaded hubs for exposed boxes outside and exposed to moisture.
- B. Concealed outlets and exposed outlets in unfinished spaces for lights, switches, wall receptacles, etc.; consist of standard galvanized steel outlet boxes and plaster rings.
1. Provide 1/16" thick boxes and covers of form and dimension adapted to its specific use and location, kind of fixture to be used and number, size and arrangement of connecting conduits.
 2. Provide 3/8" fixture studs where required.
 3. Ceiling Outlet Boxes: 4" octagonal or 4-11/16" square as required, due to number of wires, and 2" deep minimum. Ceiling boxes in slabs concrete type. Plaster rings not required for ceiling outlet unless needed for device.
 4. Paint junction boxes provided with blank covers to match surroundings, except use blank device plates in finished areas.
 5. Switch and receptacle outlet boxes: 4" square with plaster rings as necessary. Provide multigang boxes where shown or required. Provide metal barriers to separate emergency and normal service wiring per N.E.C.
 6. Steel City, Appleton, Raco, Bowers or approved equivalent.
- C. Use galvanized cast iron boxes, approved equivalent to Crouse-Hinds type "FS" or Appleton condulets, with appropriate covers for wall outlets in exposed conduit work and exposed to moisture.
- D. Use galvanized cast iron boxes equivalent to Crouse-Hinds type GRF for ceiling outlets in exposed conduit work exposed to moisture.
- E. Use square cut steel outlet boxes for outlets exposed in finished locations. Use round or square to adapt to device installed. Wiremold, Hoffman or approved equivalent.

2.02 LARGE JUNCTION BOXES

- F. Furnish pull, tap and cable support boxes required by NEC for excessive number of 90 degree

conduit bends, conductor taps and cable supports.

1. Box construction per NEC and manufactured with galvanized sheet steel, 12 gage minimum, with angle iron frame where required for rigidity; welded or bolted construction. Install bolts to prevent damage to cables in box.
2. Boxes with removable screw type covers and plated screws. Provide split covers where necessary for access. Maximum single piece cover - 36" x 36".
3. Provide separate junction boxes for each feeder. If conduit is installed so separate junction boxes are not practical, one large pull-box may be used with each set of feeder conductors separated by 12 gage steel barriers. Furnish junction box or each compartment in junction box with ground lug for connection of ground wire.

2.03 CONDUIT BODIES

- G. Conduit bodies shall be installed to provide ease of pulling conductors and to provide neat appearance of conduit installation, and as shown on drawings. Conduit bodies constructed of malleable iron or copper free aluminum castings. Bodies shall be finished with standard durable exterior coatings of manufacturer specified. Provide rollers in type "C" and type "LB" bodies, 1-1/4" size and larger. Provide gasketed plated steel or malleable iron covers.
- H. Conduit bodies shall be manufactured by Crouse-Hinds, Pyle National, Killark, Appleton or approved equivalent.

2.04 GUTTERS (Wireways)

- I. 8" x 8" and smaller - use standard assembly manufactured by Square "D", Walker Electric, B&C Stamping Co., and General Electric. Make special and larger gutters of code grade galvanized sheet steel with hinged covers and approved fastening device.

2.05 SURFACE METAL RACEWAYS

- J. Where indicated on the drawings, wiring shall be run in exposed metal raceways, metal molding or wiremold complete with outlet boxes and fittings. All circuits run in surface metal raceways shall have a ground conductor with green insulation sized per the NEC, but not smaller than No. 12 AWG screw connected to each outlet box. All wiring in surface metal raceways shall be type "THWN" conductors.

2.06 TELEPOWER POLES

- K. Where indicated on the drawings, wiring shall be run in Telepower Poles, Wiremold or equivalent, complete with entrance end fittings, hanger clamps, trim plates, etc., as required. Poles shall be secured by means of a threaded rod attached to hanger clamp and to the structural ceiling above the grid. All circuits run in Telepower Poles shall have a ground conductor with green insulation sized per the N.E.C., but not smaller than No. 12 AWG connected to the screw terminal in the entrance end fitting and to the ground terminal on the receptacles in the pole.

PART 3 - EXECUTION

3.01 INSTALLATION OF OUTLET BOXES

- A. Fasten outlet boxes securely to structure.
- B. Set all flush outlet boxes so edge of device flange is flush with finished surface.
- C. Open no more knockouts in outlet box than required.
- D. Seal boxes during construction.
- E. Stagger back to back boxes 3" minimum. In rated walls use appropriate U.L. spacing.
- F. Coordinate and verify rough-in location and mounting height of all boxes with drawings and other trades prior to installation.
- G. Support All Boxes:
 - 1. Outlet boxes - with 1/4" diameter galvanized rods or bolts anchored to structure.
 - 2. Outlet boxes for surface mounted luminaires on furred ceilings with 3/4" channel iron fastened to ceiling channels. See Section covering "Luminaires".
 - 3. Pull, junction and cable boxes with 3/8" diameter galvanized rods or bolts (4 minimum).
 - 4. Support outlet boxes in metal stud partitions with support that spans between two studs. Caddy "SGB", "TSGB", or "RBS" hangers or equal.
- H. Install adjacent outlets at different levels in one vertical line where possible.
- I. Provide green covered bonding jumper, screw connected to outlet box in all receptacle boxes.
- J. Paint wiring connections in ground mounted outlets or floor outlets in wet locations with "Scotchkote" and fill box with "Duxseal".
- K. Mark outlet box covers with permanent ink markers to indicate circuit number(s) and panel of origination. Use black markers for normal service circuits and orange for emergency service.
- L. Use 4" octagonal boxes with blank covers for master outlets, installed to permit installation of collars by others.
- M. Where outlet boxes installed in unfinished concrete walls or columns, provide 1" deep plaster ring with box and ring set in position before the concrete is poured so concrete will fill around the ring and cover plate can be installed flush with the unfinished surface. In case of brick walls, follow same procedure with mason filling around the plaster ring with mortar.
- N. Install all outlets located on columns on centerline of column and bend or shift reinforcing so that the outlet box will be flush with the finished concrete. Provide plaster rings as required so that the plate is flush with the finished plaster or exterior concrete surface.
- O. Where outlets installed in waterproofed columns or walls, provide 6"x6"x3" deep wood box

placed in the forms before concrete is poured. Box will be removed before waterproofing is applied. General Contractor will waterproof wall and opening, after which Electrical Contractor will install outlet box. General Contractor will grout around box. Set boxes carefully so that cover plates will be flush.

- P. Install conduit bodies where shown or where required for sharp bends and/or aesthetics in raceway system. Do not use in lieu of pullboxes except in limited space or as directed by Architect.

3.02 INSTALLATION OF JUNCTION BOXES

- Q. All junction boxes shall be accessible.
- R. Securely fastened to structure.
- S. Exterior below grade boxes shall be embedded 6" of concrete on sides and bottom. Top shall be level with finished grade unless shown otherwise.
- T. There shall be no more knockouts opened in any box than are actually required.
- U. Protection during construction.
- V. Identify (See Section 16014).

3.03 INSTALLATION OF GUTTERS

- W. Mount gutters on 3/4" thick plywood backboard, sized for devices to be mounted, 2 coats of Albi No. 107A fire retardant paint (install label on board), mount all equipment thereon.
- X. Run conductors in gutter without reduction in size, entire length of gutter.
- Y. Connect individual taps from conductor to tapped device with ILSCO insulated tap devices sized for conductors used.
- Z. Gutter Tops: for copper conductors shall be ILSCO type GTA or PTA with GTC or PTC insulating covers or by "TEE" compression lugs as manufactured by Anderson or Burndy, wrapped with Scotch #33 electrical tape to a thickness which equals insulation level of wire.

END OF SECTION 26 0534

SECTION 26 0543 - SERVICE CHARACTERISTICS**PART 1 - GENERAL****1.01 RATING**

A. Secondary Service: 277/480 volts, 3 phase, 4 wire, grounded neutral, wye connected.

1.02 SERVICE AND UTILITIES

- B. Arrange with local electric service company for service to be brought to project, and for the installation of meter. Pay all charges (if any) in connection therewith, including permanent meter deposit, which deposit will be refunded to Contractor at time of Owner's occupancy of the building.
- C. It is responsibility of this Section, prior to bid, to re-affirm with Utility Companies involved, that locations, arrangement, Power Company voltage, phase, metering required, and connections to utility service are in accordance with their regulations and requirements. If their requirements are at variance with these drawings and specifications, contract price shall include an additional cost necessary to meet those regulations without extra cost to Owner after bids are accepted.
- D. Obtain from Utility Company any additional charges for service of type, size and location called for. Include charges in bid to be paid by Contractor to appropriate party. Provide payment of these charges so as to allow logical progression of construction and avoid delay of completion.
- E. Should cost above not be available prior to bid, submit with bid a letter signed by responsible Utility Company personnel stating that cost is not available. Prime Contractor shall submit letter with his bid to Owner. Cost will then be omitted from contract and become responsibility of Owner.
- F. Furnish with shop drawings a signed document from each utility company describing location and type of service to be supplied and requirements for service. Document shall be signed by the appropriate responsible representative of the respective Utility Company.

PART 2 – PRODUCTS: Not Applicable.**PART 3 - EXECUTION****3.01 PAD MOUNTED TRANSFORMER SERVICE**

- A. Service to facility consists of underground primary service from riser pole to new pad mounted transformer, with underground secondary service from transformer(s) to main distribution equipment.
- B. Power Company furnishes and installs following:
 1. All facilities on primary riser pole.
 2. Primary cable from the riser pole to pad mounted transformer complete with connections at each end.
 3. Pad mounted transformer complete.
- C. Provide the following:

1. Primary duct bank from riser pole to transformer. Duct bank consists of PVC duct encased in concrete as shown. See Section covering "Raceways". Use long radius, 36" minimum, PVC elbows, same as duct. Terminate ducts at pole with cast iron double hubs as directed by Power Company. Terminate ducts in transformer pad with approved bushings.
2. Transformer pad: Build transformer pad to Power Company's specifications. Pad consists of 3000# concrete reinforced with #4 steel bars 12" o.c. in both horizontal directions. Provide 1" x 45 degree chamfer on all top edges. Obtain detail drawings from Power Company for location of anchor bolts, and complete pad details. Pad construction to conform to the Power Company details. Provide two 3/4" x 10" copper clad steel ground rods in pad as shown.
3. Underground secondary service from transformer consists of conductors in conduit. Terminate conduits inside transformer. Make secondary connections to transformer. Leave necessary slack conductors for secondary connections.
4. Coordinate all service work with Power Company and install the work in accordance with their requirements and recommendations.

3.02 UNDERGROUND SERVICE TO POLE

- D. Secondary service to facility is existing.

3.03 METERING

- E. Install devices and conduit for Power Company metering of secondary service as shown. Power Company will furnish meter, meter socket, donut CT's and meter conductors to Contractor for installation. Install any additional conduit, junction boxes, etc., as required by Power Company.
- F. Install meter equipment in accordance with Power Company requirements.

END OF SECTION 26 0543

SECTION 26 0553 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Systems and equipment requiring identification are shown on the drawings, and extent of identification is specified herein and in individual sections of work.
- B. Types of electrical identification include:
 - 1. Exposed conduit color marking.
 - 2. Buried cable and conduit warnings.
 - 3. Cable/conductor identification.
 - 4. Operational instructions and warnings.
 - 5. Danger signs.
 - 6. Equipment/system identification signs (nameplates).

1.02 SUBMITTALS

- C. Manufacturer's Data:
 - 1. Product specifications and installation instructions for each material and device.
- D. Samples:
 - 1. Provide for each color, lettering style and other graphic representation.

PART 2 - PRODUCTS

2.01 ELECTRICAL IDENTIFICATION MATERIAL

- A. Color-Coded Conduit Markers:
 - 1. Color code all conduit with 3/4 inch wide band of vinyl plastic electrical tape, 3M Company "Scotch 35", applied two (2) full turns around conduit, 6" from all conduit terminations into switchboards, panelboards, motor control centers, starters, cabinets, control panels, pullboxes, outlet boxes, etc., on each side of walls, floors or roof penetrated by conduit and where conduit enters wall to outlets below.

<u>SYSTEM</u>	<u>CONDUIT COLOR CODE</u>	<u>COLOR</u>
120/208 Volts - Normal		Black
277/480 Volts - Normal		Yellow
120/208 Volts - Emergency		Black and Red
277/480 Volts - Emergency		Yellow and Red
Intercom/Paging/Music/Telephone/Dictation		Brown
Computer/Word Processing/Monitoring/Security		Blue
Fire Alarm		Orange

- B. Where authority does not allow tape use paint acceptable to authority.

- C. Underground Line Marker/ Warning tape:
1. Permanent colored, detectable plastic tape with foil core (color per AWWA Standard for utility being identified), with continuous-printed legend; for direct-burial service; minimum 6" wide x 4 mils thick. Legend to indicate type service of cable (e.g. "WARNING: Buried Electric Line").
- D. Cable/Conductor Identification Bands:
1. Manufacturer's standard vinyl-cloth self-adhesive cable/conductor markers, wrap-around type; pre-numbered plastic coated, or write-on type with clear plastic self-adhesive cover flap, lettered to show circuit identification.
- E. Self-Adhesive Plastic Signs:
1. Manufacturer's standard, self-adhesive, pre-printed, flexible vinyl signs for operational instructions or warnings. Sizes suitable for application and visibility, with proper wording for application.
 2. Color: Orange with black lettering.
- F. Danger Signs:
1. Manufacturer's standard "DANGER" signs, baked enamel finish on 20 gage steel; standard red, black and white graphics; 14" x 10" unless 10" x 7" is largest which can be applied, or where larger size is needed for visibility use recognized explanation wording (as examples: HIGH VOLTAGE, KEEP AWAY, BURIED CABLE, DO NOT TOUCH SWITCH).
- G. Engraved Signs (Nameplates)
1. 1/8" thick melamine plastic laminate, complying with FS LP-387, sizes as indicated, engrave with standard letter style of sizes and wording indicated (1/4" letters minimum) white field, black letters for normal service; red field, white letters for essential service; yellow field, blue letters for D.C. service; orange field, white letters for UPS service. Punched for screws.
 2. Fasteners: Self-tapping stainless steel screws, except contact epoxy adhesive where screws cannot or should not penetrate substrate.
- H. Lettering and Graphics:
1. Coordinate names, abbreviations and other designations used with those shown or specified. Provide numbers, lettering, and wording as indicated or required for identification and operation/maintenance.

PART 3 - EXECUTION

3.01 APPLICATION AND INSTALLATION

- A. General Installation Requirements:

1. After completion of painting.
 2. Comply with governing regulations and requests of governing authorities for identification of electrical work.
- B. Conduit Identification:
1. Where high voltage conduit is exposed, apply identification to conduit.
- C. Underground Cable and Duct Identification:
1. During back-filling of underground cable or duct, install continuous marker warning tape, directly over buried line 6" to 12" below finished grade. Where multiple lines are buried in common trench not exceeding 24" width, install a single line marker.
 2. Install line marker warning tape for every buried ductbank.
- D. Operational Identification and Warnings:
1. Provide operational signs for main switch.
- E. Danger Signs:
1. Provide for 5 KV to 35 KV medium voltage switchgear, sectionalizer loop switches, etc., as shown and described herein.
 2. Provide as required by codes.
- F. Engraved Plastic Laminated Signs: Install on each major unit of electrical equipment in the building. Provide single line of text, 1/4" high lettering on 1" high sign (1-1/2" high where 2 lines required). Matching terminology and numbering of contract documents. Provide signs for each unit of the following categories (signs shall identify item fed, voltage where fed from):
1. Electrical cabinets and enclosures. Indicate voltage.
 2. Access panel/doors to electrical facilities.
 3. Major electrical switchgear (indicate voltage).
 4. Electrical substations.
 5. Safety switches and circuit breakers.
 6. Transformers.
 7. Feeders in pull and junction boxes and in all switchgear. Fasten with nylon ties.
 8. All equipment furnished in this Division of the specifications.
 9. Install signs where indicated or most visible. Secure with screws or epoxy adhesive. Secure to feeder cables with nylon ties.

10. Nameplate sign shall include system voltage and source of feed (where applicable).
- G. Outlet pull, and junction boxes shall be identified with circuit number(s), and source panel or switchgear/switchboard indicated with legible text written with permanent black marker. Write text and box cover.
- H. Branch circuit and feeder conductors shall be identified where they enter pullboxes, switchgear, switchboards, panelboards, transformers, and handholes. Feeder identification shall include source, conductor size, and phase identification.
- I. Provide engraved device plates for wiring devices where indicated on drawings or related sections of the specifications.
 1. Use black letters for devices on normal circuits; use red letters for essential circuits.

END OF SECTION 26 0553

SECTION 26 0923- LIGHTING CONTROL DEVICES**PART 1 - GENERAL****1.01 RELATED DOCUMENTS**

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

1.02 SUMMARY

- B. This Section includes the following lighting control devices:
 - 1. Time switches.
 - 2. Outdoor and indoor photoelectric switches and daylight sensors.
 - 3. Switch-box occupancy sensors.
 - 4. Indoor occupancy sensors.
 - 5. Outdoor motion sensors.
 - 6. Multi-pole contactors.
 - 7. Wallbox-style dimmers.
- C. Related Sections include the following:
 - 1. Division 16 Section "Switches and Receptacles" for manual light switches.

1.03 DEFINITIONS

- D. LED: Light-emitting diode.
- E. PIR: Passive infrared.

1.04 SUBMITTALS

- F. Product Data: For each type of product indicated.
- G. Shop Drawings: Show installation details for occupancy and light-level sensors.

PART 2 - PRODUCTS**2.01 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS**

- A. Line-Voltage Surge Protection: An integral part of the devices for 120- and 277-V solid-state equipment. For devices without integral line-voltage surge protection, field-mounting surge protection shall comply with IEEE C62.41 and with UL 1449.

2.02 TIME SWITCHES

- B. Digital Time Switches: Electronic, solid-state programmable units with alphanumeric display complying with UL 917.
 - 1. Contact Configuration: SPDT (Single-Pole Double-Throw)

2. Contact Rating: 20-A ballast load, 120/208/240/277 Vac. Contact output for both maintained and momentary (pulse) to allow control of latching contactors.
 3. Programs: 4 channels.
 - a. For each channel, provide daily, weekly, or yearly schedules with a minimum of 1000 set points and an annual holiday schedule (up to 99 holidays) to override normal schedule.
 4. Circuitry: Allow connection of a photoelectric relay as substitute for on and off function of a program on selected channels.
 5. Astronomical Time: User scheduled for on or off function of a program on selected channels.
 6. Battery Backup: 8 year lithium battery.
 7. Memory: All programming and time functions shall be stored in EEPROM non-volatile memory.
 8. Surge Protection: Circuitry shall utilize transient voltage surge protection for voltage surges up to 6000V.
 9. Manual and Remote override.
 10. Approved Products: "Next Generation" series by Intermatic or equivalent by Tork.
- C. Wallbox Time Switch: Digital programmable time switch, designed to replace a standard toggle switch, to turn lights OFF after a preset time period.
1. Completely self-contained control system, with standard single-gang switch device mounting and grounding strap with ground wire. Provide with compatible single-gang wallplate, color to match device (See section for "Switches and Receptacles" for device finish).
 2. Switching mechanism shall be a latching air gap relay and utilize "zero crossing circuitry" to maximize relay life. Switch shall also be capable of operating as a manual ON-OFF switch.
 3. Switch circuitry shall be compatible with all types of lighting loads, including tungsten, halogen, and fluorescent and HID ballasts (electro-magnetic and electronic).
 4. Switch shall have no minimum load requirement and be capable of handling up to 800 watts (at 120 volt) or 1200 watts (at 277 volt) of lighting load.
 5. Switch circuitry for time-off period shall be adjustable from 5 minutes to 12 hours (increments of 5 minutes up to one hour, and 15 minutes from 1 hour to 12 hours).
 6. The time switch shall have optional warnings, including light flash and audible beep, for notifying occupant that the time-off period is expiring.
 7. Approved Product: TS-400 by WattStopper or TD200 by Hubbell.

2.03 OUTDOOR PHOTOELECTRIC SWITCHES

- D. Description: Solid state, with SPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, microprocessor input, and complying with UL 773A.
1. Light-Level Monitoring Range: 1.5 to 10 fc (16 to 108 lx), with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.
 2. Time Delay: Instant ON;10-second delay OFF, to prevent false operation.
 3. Surge Protection: Metal-oxide varistor type, complying with IEEE C62.41 for Category A1 locations.
 4. Mounting: Twist lock receptacle complying with ANSI/IEEE C136.10, with base mounting accessory as required to direct sensor to the North sky exposure.
- E. Approved Product: K4536SS by Intermatic, or equal by Tork or Paragon.

2.04 INDOOR PHOTOELECTRIC SWITCHES

- F. On/Off (closed loop) Photoelectric Switch: Solid-state, light-level sensor unit, with separate relay unit, to detect changes in lighting levels that are perceived by the eye. Cadmium sulfide photoresistors are not acceptable.
1. Sensor Output: Contacts rated to operate the associated relay, complying with UL 773A. Sensor shall be powered from the relay unit.
 2. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
 3. Light-Level Monitoring Range: 10 to 200 fc (108 to 2150 lx), with an adjustment for turn-on and turn-off levels within that range.
 4. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling, with deadband adjustment.
 5. Indicator: Two LEDs to indicate the beginning of on and off cycles.
 6. Approved Product: Watt Stopper #LS100.
- G. Dimming Control (Open-Loop) for Daylight Compensation: Electronic solid-state controller with separate photo-sensor to measure incoming light and proportionally adjust the dimmer output.
1. Controller Output to Dimmer: 0-10Vdc, compatible with dimming ballasts by Advance, Osram-Sylvania and Lutron. (Ecoyo Series)
 2. Control system shall use open-loop algorithms to determine signal output to dimming ballasts.

3. Photosensor: 30-3000 fc monitoring range, low-voltage.
 4. Approved Product: Watts Stopper LCD-series or equal.
- H. Dimming Control (Closed-Loop) for Daylight Compensation: Self-contained, ceiling-mounted control device that detects changes in light levels and raises or lowers electrical fluorescent lighting in response.
1. Controller output to fluorescent dimming ballast is 0-10Vdc, compatible with dimming ballasts by Advance, Osram-Sylvania, and Lutron (ECO10 series).
 2. The photosensor shall be low-voltage, powered by 24Vdc power pack.
 3. The photosensor shall utilize a photocell that measures only in the visual spectrum and has a response curve that matches the photopic curve. It shall not measure in the ultra violet or infrared range (<5% for wavelengths < 400 nm or > 700 nm).
 4. Sensor adjustments shall be made remotely with wireless remote control that shall be furnished with the product.
 5. The photosensor shall have a control range of 20 –60 footcandles.
 6. Approved product: Wattstopper Model LS-301.

2.05 INDOOR OCCUPANCY SENSORS

- I. Switch Box Sensors: PIR type with integral power-switching contacts rated for 800 W at 120-V ac, suitable for incandescent light fixtures, fluorescent light fixtures with magnetic or electronic ballasts, or 1/6-hp motors; (rated for 1000 W at 277-V ac).
1. Approved product: Wattstopper WI-200
- J. Wall- or ceiling-mounting, sensor.
1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 30 minutes.
 2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit. Sensor shall include auxiliary single-pole, double-throw isolated relay.
 3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
 4. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.

- c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door or coverplate.
 5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
 6. Bypass Switch: Provide manual OFF/ON function facilitated by installation of a momentary contact switch.
 - a. Approved Bypass Switch: Wattstopper LVS-1 or approved equal.
- K. PIR Type: Ceiling mounting; detect occupancy by sensing a combination of heat and movement in area of coverage.
 1. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of at least 36 sq. in..
 2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch high ceiling.
 3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot high ceiling.
 4. Approved Product: Wattstopper CI-300I (ceiling) CX-100 (Wall).
- L. Ultrasonic Type: Ceiling mounting; detect occupancy by sensing a change in pattern of reflected ultrasonic energy in area of coverage.
 1. Detector Sensitivity: Detect a person of average size and weight moving at least 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch high ceiling.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on an 8-foot high ceiling.
 4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch high ceiling.
 5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foot high ceiling in a corridor not wider than 14 feet.
 6. Approved Product: Wattstopper UT-300.
- M. Dual-Technology Type: Wall or Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on and off functions shall be selectable in the field by operating controls on unit.
 1. Sensitivity Adjustment: Separate for each sensing technology.

2. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of at least 36 sq. in., and detect a person of average size and weight moving at least 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch high ceiling.
 4. Approved Product: Wattstopper DT-300 (ceiling) or DT-200 (wall).
- N. Approved Occupancy Sensor Manufacturers: Leviton, Hubbell, Novitas, Sensor Switch, or Wattstopper.

2.06 MULTIPOLE LIGHTING CONTACTORS

- O. Approved Manufacturers:
1. Allen-Bradley/Rockwell Automation.
 2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
 3. Cutler-Hammer; Eaton Corporation.
 4. GE Industrial Systems.
 5. Square-D
- P. Description: Electrically operated and electrically held, complying with NEMA ICS 2 and UL 508.
1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
 2. Control-Coil Voltage: Match control power source.

2.07 WALLBOX-STYLE DIMMERS

- Q. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible frequency and EMI/RFI filters.
1. Control: Continuously adjustable slider; with single-pole or three-way switching to suit connections.
 2. Incandescent Lamp Dimmers: Modular, 120V, 60 Hz with continuously adjustable slider; single pole with soft tap or other quiet switch; EMI/RFI filter to eliminate interference; and 5-inch (130-mm) wire connecting leads.
 3. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 1% of full brightness (depending on ballast-type).
 4. Approved Manufacturers:
 - a. Lutron, Nova-T series.

2.08 CONDUCTORS AND CABLES

- R. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG.
- S. Classes 2 and 3 Control Cable: Multiconductor cable with stranded copper conductors not smaller than No. 18 AWG.
- T. Class 1 Control Cable: Multiconductor cable with stranded copper conductors not smaller than No. 14 AWG.
- U. Provide unshielded, twisted-pair cable for control and signal transmission conductors.

PART 3 - EXECUTION**3.01 SENSOR INSTALLATION**

- A. Install according to manufacturer's instructions. Install and aim sensors in locations to achieve at least 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.
- B. Do not install ultrasonic or dual-technology occupancy sensors closer than 4 feet from air supply outlets / diffusers.

3.02 WIRING INSTALLATION

- C. Wiring Method: Comply with Division 16 Section "Conductors." Minimum conduit size shall be 1/2 inch.
- D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- E. Provide field-mounting transient voltage suppressors for lighting control devices locations that do not have integral line-voltage surge protection.
- F. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
- G. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.
- H. 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.

3.03 IDENTIFICATION

- I. Identify components and power and control wiring.

- J. Label time switches and contactors with a unique designation. Provide a typewritten directory identifying circuits and spaces controlled by contactors.

3.04 FIELD QUALITY CONTROL

- K. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test in compliance with manufacturer recommendations.
 - 2. Operational Test: Verify actuation of each sensor and adjust time delays per manufacturer's instructions.
- L. Remove and replace lighting control devices where test results indicate that they do not function properly.
- M. Additional testing and inspecting, at Contractor's expense, may be performed to determine compliance of work with specified requirements.

3.05 ADJUSTING

- N. Occupancy Sensor Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose.
- O. Daylight Sensor Adjustments: Contractor shall provide on-site service to adjust sensors immediately after owner has occupied the space. An additional on-site visit shall be provided up to 12 months from date of substantial completion. At the end of the adjustment period, contractor shall turn-over accessories used for making adjustments, such as wireless remote controls, to the Owner.

END OF SECTION 26 0923

SECTION 26 2417 – PANELBOARDS**PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Lighting and power panelboards and their installation.

1.02 SUBMITTALS

- B. Provide shop drawings. Include individual diagram of each panelboard showing all specified requirements.

PART 2 - PRODUCTS**2.01 GENERAL**

- A. Construct panelboards in accordance with latest NEMA and UL standards.
- B. Panelboards to be same manufacturer as other distribution equipment.
- C. Panelboard assembly UL labeled, and UL labeled as Service Entrance Equipment where used for that purpose.
- D. Panelboards to have integrated equipment fault rating equal to interrupting rating of lowest rated overcurrent device.
- E. Panelboards shall be factory assembled.

2.02 PANEL INTERIOR

- F. Bussing:
 - 1. 98% conductivity copper, silver-plated at joints or equivalent plated 55% conductivity aluminum.
 - 2. Bus assembly designed for a maximum temperature rise of 55 degree C above 40 degree C ambient temperature when carrying rated current.
 - 3. Minimum thickness of bus bars - 3/32".
 - 4. Bussing braced to withstand a fault current equal to the highest device interrupting capacity in the panel.
 - 5. Neutral bus full size copper or aluminum sized on same basis as phase busses and insulated from the cabinet.
 - 6. Arrange bus bar connections so that adjacent vertical circuit protective devices are consecutively connected to phases A, B, and C throughout panel. Provide full capacity ground bus in each panel cabinet, bolted to cabinet. Where indicated for Isolated Ground, provide second ground bus isolated from cabinet.

- G. Cable terminations:
1. Include neutral and ground connections as shown.
 2. Make with separate, individual heavy casting aluminum, AL/CU rated lugs, Thomas & Betts, Ilco, Blackburn or approved equivalent.
 3. Use 2 bolt tongue or equivalent connection to bus for #1/0 or larger cables.
 4. Securely bolt lugs to bus with bolts, nuts and lock washers.
 5. Provide double lugs on main bus where shown.
 6. Feed-through lugs (one set of lugs on each end of main vertical bus) is not acceptable unless approved by Architect.
- H. Circuit breakers:
1. Molded case, thermal-magnetic, quick-make, quick-break, trip free on faults, thermal-inverse time delay element and magnetic instantaneous trip coil in each ungrounded phase conductor, or approved equivalent solid state trip unit.
 2. Engrave breaker ampere rating on handle or trip unit.
 3. Furnish multi-pole breakers with internal common trip.
 4. Ground fault breakers class "A" type to trip on fault currents of 4-6 ma.
 5. Main circuit breakers UL rated for service entrance use.
 6. Switch "SWD" rated where required by NEC.
- I. Panelboards classified by type over-current protection as follows:
1. BQL Bolted quick-lag circuit breaker distribution, 0-100 ampere branches, with minimum interrupting rating of 22,000 symmetrical amperes at 208 volts. Equivalent to Square "D", NQOD, Siemens NLAB, Cutler-Hammer BB, G.E. NLAB.
 2. CCB Heavy duty convertible circuit breaker distribution, 0-800 ampere branches with minimum interrupting rating of 42,000 symmetrical amperes at 208 volts. Equivalent to Square "D", I-Line, Siemens CDP-6, Cutler-Hammer CDP, G.E. type CCB.
- J. All space in panelboards usable. Panelboard space provided with necessary connections for future installation of overcurrent devices.

2.03 CABINETS

- K. Code thickness, hot dip galvanized steel or painted with trim and door. Hardware: combination

latch and cylinder lock, all keyed the same. Provide celluloid or plastic covered directory card holder on the inside of door. Trim, door and exposed interior shall be finished with factory prime and smooth finish coat of the color selected by Architect. Reinforce cabinets as necessary for service and short circuit rating intended.

- L. Flush or surface as indicated of sufficient size to allow minimum 3" gutter space each side of panel and eight inches (8") at top and bottom, minimum 20" wide. Provide adjustable trim clamp, semi-flush hinges and inside rabbet.
- M. Provide panels with hinged trim construction.

2.04 MANUFACTURERS

- N. Panelboards manufactured by Siemens, Square D, General Electric, or Cutler-Hammer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Mount panelboards securely to building structure with 3/8" minimum diameter galvanized bolts and inserts number as required for size of panel, but not less than 4. Mount panelboards with centerline 4'-6" approximately above finished floor. Where panels of different heights are mounted adjacent, install top of panel trim at same height above floor. Close all unused openings.
- B. Where two sets of feeder cables are required in panel gutter space, run one set in each side of panel.

3.02 IDENTIFICATION

- A. Permanently attach nameplates and circuit numbers to panel.
- B. Use horizontal consecutive circuit numbers for lighting and appliance panels unless shown otherwise on panelboard schedules.
- C. Provide typewritten circuit directories describing service of each circuit in Types BQL panels.
- D. Provide laminated plastic nameplate circuit identification for each circuit in Types CCB panels.
- E. Provide each panelboard with nameplate showing name and voltage.

END OF SECTION 26 2417

SECTION 26 2726 – WIRING DEVICES**PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Wiring devices and plates (receptacles, switches, Floor service outlets, poke-through assemblies, and multi-outlet assemblies) and their installation.
- B. Related Sections:
 - 1. Division 16 Section “Lighting Control Devices”

1.02 DEFINITIONS

- C. EMT: Electromagnetic interface
- D. GFCI: Ground-fault circuit interrupter
- E. Pigtail: Short lead used to connect a device to a branch-circuit conductor
- F. RFI Radio-frequency interference
- G. TVSS: Transient voltage surge suppressor
- H. UTP: Unshielded twisted pair

1.03 SUBMITTALS

- I. Product Data: For each type of product indicated.
- J. Shop Drawings: Listed legends and description of materials and process used for pre-marking wall plates
- K. Samples: One (1) for each type of device and wall plate specified in each color specified, as requested by Architect.
- L. Field-quality-control test reports.
- M. Operation and Maintenance Data: For wiring devices to include in all manufacturers’ packing label warnings and instruction materials that include labeling conditions.

1.04 QUALITY ASSURANCE

- N. Source Limitations: Obtain each type of wiring device and associated wall plate through one (1) source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one (1) source.
- O. 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.

- P. Comply with NFPA 70.

1.05 COORDINATION

- Q. Receptacles for equipment: Match plug configurations.
1. Cord and Plug Set: Match equipment requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, the following:
1. Hubbell
 2. Cooper
 3. Pass & Seymour
 4. Leviton
 5. Wiremold/Walker

2.02 DEVICES

- B. Furnish devices as shown in Table 1. Catalog numbers establish minimum standard of quality. Submit list of devices with catalog number proposed for review prior to ordering.
- C. Use gray color, except in special areas designated elsewhere.
- D. Special colors selected from standard available of almond, white, brown, black, or grey. Furnish color chart.
1. Use red color for devices on essential power circuits.
 2. Use orange color for isolated ground receptacles, or as specified above with orange triangle on face.
 3. Use blue for TVSS devices.
- E. Device Plates:
1. Furnish devices with cover plates, .04" thick, type 302, stainless steel with brushed finish.
 2. Device plates in special areas to match device color.
 3. Furnish configuration of device plates required for multi-gang installations.
 4. Furnish weatherproof devices with individual gasketed aluminum or stainless steel covers U. L. listed for wet locations "In-Use".

2.03 GFI RECEPTACLES

- F. General Description: Straight blade, non-feed through type. Comply with NEMA WD 1, NEMA

WD 6 UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

2.04 TVSS RECEPTACLES

- G. General Description: Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 1449 with integral TVSS in line to ground, line to neutral, and neutral to ground.
 - 1. TVSS Components: Multiple metal-oxide varistors, with a nominal clamp-level rating of 400 volts and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
 - 2. Active TVSS Indication: Visual and audible with light visible in face of device to indicate device is “active” or “no longer in service.”

2.05 PENDANT CORD-CONNECTOR DEVICES

- H. Description: Matching, locking-type plug and receptacle body connector; NEMA WD 6 configurations L5-20P and L5-20R, heavy-duty grade.
 - 1. Body: Nylon with screw-open cable-gripping jaws and provision for attachment external cable grip.
 - 2. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.06 CORD AND PLUG SETS

- I. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.
 - 1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket, with green-insulated grounding conductor and equipment-rating ampacity, plus a minimum of 30 percent.
 - 2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.07 SNAP SWITCHES

- J. Comply with NEMA WD 1 and UL 20.
- K. Switches, 120/277 volt, 20 amp.

2.08 FAN SPEED-CONTROLS

- L. Modular, 120-volt full-wave, solid-state units with integral, quiet on-off switches and audible frequency, and EMI / EFI filters. Comply with UL 1917.
 - 1. Continuously adjustable slider, 1.5 amp.
 - 2. Three-speed adjustable slider, 1.5 amp.

2.09 FLOOR SERVICE FITTINGS

- M. Type: Modular dual-service units suitable for wiring method used.
- N. Compartments: Barrier separates power from voice and data communication cabling.
- O. Service Plate: Rectangular die-cast aluminum with satin finish.
- P. Power Receptacle: NEMA WD 6 configuration 5-20R gray finish, unless otherwise indicated.
- Q. Voice and Data Communication Outlet: two modular, keyed, color-coded, RJ-45 Category 5e jacks for UTP cable

2.10 POKE-THROUGH ASSEMBLIES

- R. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hubbell Incorporated; Wiring Device-Kellems
 - 2. Pass & Seymour / Legrand; Wiring Devices and Accessories
 - 3. Thomas & Betts Corporation
 - 4. Wiremold Company (The)
- S. Description: Factory-fabricated and factory-wired assembly of below-floor junction box with multi-channeled, through floor raceway/firestop unit and detachable matching floor service outlet assembly.
 - 1. Service Outlet Assembly: Flush type with services indicated.
 - 2. Size: Selected for nominal 3-inch or 4-inch cored holes in floor and matched to floor thickness.
 - 3. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
 - 4. Closure Plug: Arranged to close unused cored openings and reestablish fire rating of floor.
 - 5. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors and a minimum of two (2), 4-pair, Category 5e voice and data communication cables.

2.11 MULTI-OUTLET ASSEMBLIES

- T. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hubbell Incorporated; Wiring Device-Kellems
 - 2. Wiremold Company (The)
 - 3. Panduit
- U. Components of Assemblies: Products from a single manufacturer designed for use as a complete matching assembly of raceways and receptacles.

V. Raceway Material: Metal with manufacturer's standard finish.

W. Wire: No. 12 AWG

2.12 SERVICE POLES

X. Description: Factory-assembled and factory-wired units to extend power, and voice and data communications from distribution wiring concealed in ceiling to devices or outlets in pole near floor.

1. Poles: Normal 2.5-inch square cross section, with height adequate to extend from floor to at least 6 inches above-ceiling, and with separate channels for power wiring, and voice and data communication cabling.
2. Mounting: Ceiling trim flange with concealed bracing arranged for positive connection to ceiling supports; with pole foot and carpet pad attachment.
3. Finishes: satin anodized aluminum.
4. Wiring: Sized for minimum of five (5) No. 12 AWG power and ground conductors and a minimum of four (4) 4-pair Category 3 or 5 voice and data communication cables.
5. Power Receptacles: Two (2) duplex 20-amp heavy-duty, NEMA WD 6 configuration 5-20R units.
6. Voice and Data Communication Outlets: Four RJ-45 Category 5e jacks.

TABLE 1 – BASIS-OF-DESIGN WIRING DEVICES

DEVICE	NEMA CONF.	MANUFACTURER	CATALOG # HEAVY DUTY SPEC GRADE	CATALOG # HOSPITAL GRADE
Single Receptacle	5-20R	Hubbell	HBL5361	HBL8310
Single Receptacle	6-20R	Hubbell	HBL5461	HBL5461
Single Receptacle	14-20R	Hubbell	HBL8410	HBL8410
Single Receptacle	15-20R	Hubbell	HBL8420	HBL8420
Single Receptacle	5-30R	Hubbell	HBL9308	HBL9308
Single Receptacle	6-30R	Hubbell	HBL9330	HBL9330
Single Receptacle	14-30R	Hubbell	HBL9430A with 6ft. rubber cord set	HBL9430A with 6ft. rubber cord set
Single Receptacle	6-50R	Hubbell	HBL9367 w/9368 plug	HBL9367 w/9368 plug
Single Receptacle	14-50R	Hubbell	HBL9450A w/ cord set	HBL9450A w/ cord set
Single Receptacle	15-50R	Hubbell	HBL8450A w/ cord set	HBL8450A w/ cord set
Single Receptacle	L5-20R	Hubbell	HBL2310	HBL2310
Single Receptacle, Portable X-ray	X-Ray 60A, 250V (2P,3W)	Hubbell	N/A	HBL25605 w/ 25615 plug
Duplex Receptacle	5-20R	Hubbell	HBL5362	HBL8300H
Duplex Receptacle, Isolated Ground	5-20R IG	Hubbell	IG5362	IG8362SA
Duplex Receptacle, GFCI, Weatherproof	5-20R GF	Hubbell	GFR5362TR w/ WP26E cover	GFR8300TR w/ WP26E cover
Duplex Receptacle, Tamper-Proof	5-20R TP	Hubbell	HBL8300SG	HBL8300SG
Duplex Receptacle, GFCI	5-20R GF	Hubbell	GFR5362TR	GFR8300HLA
Floor Outlet with Equipment Connection	¾" NPT	Wiremold	881/881ADP-896	881/881ADP-896
Floor Outlet with Duplex Receptacle	5-20R	Wiremold	881/881ADP-895/ HBL5362	881/881ADP-895/ HBL8300H
Floor Outlet Double Duplex Receptacle	5-20R	Wiremold	880MP-827-(2)828R/ HBL5362	880MP-827-(2)828R/ HBL8300H
Wall Switch 1-Pole	20A,120/277V	Hubbell	CS1221	CS1221
Wall Switch 2-Pole	20A,120/277V	Hubbell	CS1222	CS1222
Wall Switch 3-Way	20A,120/277V	Hubbell	CS1223	CS1223
Wall Switch 4-Way	20A,120/277V	Hubbell	CS1224	CS1224
Wall Switch, SPDT Momentary Contact, Center OFF	20A,120/277V	Hubbell	HBL1557	HBL1557
Wall Switch 1-Pole, Locking Key	20A,120/277V	Hubbell	HBL1221L	HBL1221L
Wall Switch 1-Pole, Pilot	20A,120/277V	Hubbell	HBL1221PL	HBL1221PL
Wall Switch 1-Pole Lighted Handle	20A,120/277V	Hubbell	HBL1221ILC	HBL1221ILC

PART 3 - EXECUTION**3.01 INSTALLATION**

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
 - 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
 - 2. Keep outlet boxes free of plaster drywall joint compound, mortar, cement, concrete dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or picking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300 without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtail existing conductors is permitted provided the outlet box is large enough.
- D. Device Installation:
 - 1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
 - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 - 3. Do not remove surface protection, such as plastic film and smudge covers, until last possible moment.

4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
 6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
 7. When conductors larger than No. 12 AWG are installed on 15- or 20-amp circuits, splice No. 12 AWG pigtails for device connections.
 8. Tighten unused terminal screws on the device.
 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
 10. Devices shall be installed secure, tight, and flush to the wall surface. Install outlet box extension rings or spacers to bring device flush to surface.
- E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.
 2. Install hospital-grade receptacles in patient-care areas with the ground pin at the top.
- F. Device Plates: do not use oversized or extra-deep plates. Repair wall finishes and re-mount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Arrangement of Devices: unless otherwise indicated, mount flush with long dimension vertical and with grounding terminals of receptacles on top. Group adjacent switches under single, multi-gang wall plates.
- H. Adjust location of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.02 IDENTIFICATION

- A. Comply with Division 16 Section "Identification for Electrical Systems."
1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.
 2. Engraving shall be 1/4" high letters.
 3. Color of letter fill corresponding to branch of electrical system:
 - a. Black for Normal

- b. Red for Essential/Emergency
 - c. Blue for UPS
4. Engrave all device plates for receptacles dedicated for utilization by specific equipment with name of equipment served (“X-ray”, “Bed”, Copier”, etc.)

3.03 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- 1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
 - 2. Test Instruments: Use instruments that comply with UL 1436.
 - 3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.
- B. Tests for Convenience Receptacles:
- 1. Line Voltage: Acceptable range is 105 to 132 V.
 - 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
 - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 - 6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
 - 7. Test straight blade hospital-grade convenience outlets for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz.

END OF SECTION 26 2726

SECTION 26 2813 – FUSES**PART 1 - GENERAL****1.01 RELATED DOCUMENTS**

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

1.02 SUMMARY

- B. This Section includes the following:
 - 1. Cartridge fuses rated 600 V and less for use in switches.
 - 2. Spare-fuse cabinets.

1.03 SUBMITTALS

- C. Product Data: Include the following for each fuse type indicated:
 - 1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
 - 2. Let-through current curves for fuses with current-limiting characteristics.
 - 3. Time-current curves, coordination charts and tables, and related data.
 - 4. Fuse size for elevator feeders and elevator disconnect switches.
- D. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
 - 1. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
 - 2. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
- E. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 - a. Let-through current curves for fuses with current-limiting characteristics.
 - b. Time-current curves, coordination charts and tables, and related data.
 - c. Ambient temperature adjustment information.

1.04 QUALITY ASSURANCE

- F. Source Limitations: Obtain fuses from a single manufacturer.
- G. 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.
- H. Comply with NEMA FU 1.
- I. Comply with NFPA 70.

1.05 PROJECT CONDITIONS

- J. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.06 COORDINATION

- K. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size.

PART 2 - PRODUCTS**2.01 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper Bussman, Inc.
 - 2. Eagle Electric Mfg. Co., Inc.; Cooper Industries, Inc.
 - 3. Ferraz Shawmut, Inc.
 - 4. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

2.02 CARTRIDGE FUSES

- B. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.
- C. Basis of design products:
 - 1. Class L, current-limiting time delay – Bussman “Low Peak” KRP-C
 - 2. Class RK1, time-delay, dual-element – Bussman “Low Peak”, LPS-RK
 - 3. Class RK5, time-delay, dual-element – Bussman “Fusetron” FRS-R
 - 4. Class J, time-delay, dual-element – Bussman “Low Peak” LPJ
 - 5. Class L, fast-acting, current-limiting, Bussman “Limitron” KTU

2.03 SPARE-FUSE CABINET

- D. Cabinet: Wall-mounted, 0.05-inch- (1.27-mm-) thick steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.

1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
2. Finish: Gray, baked enamel.
3. Identification: "SPARE FUSES" in 1-1/2-inch- (38-mm-) high letters on exterior of door.
4. Fuse Pullers: For each size of fuse.
5. Place in the main electrical room.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 FUSE APPLICATIONS

- D. Motor Branch Circuits:
 1. Motors larger than 5 hp – RK1
 2. Motors 5 hp and smaller – RK5
- E. Other Branch Circuits: Class RK5, time delay.
- F. Feeders:
 1. 600 amp and smaller – RK1
 2. Larger than 600 amp – Class L time-delay
- G. Service Entrance:
 1. Larger than 600 amp – Class L fast-acting
 2. 600 amp and smaller – Class RK1
- H. Low-Voltage Transformer: Class RK1
- I. Elevator Machine Disconnect – Class J dual-element, time-delay

3.03 INSTALLATION

- J. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- K. Install spare-fuse cabinet(s).

3.04 IDENTIFICATION

- L. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 26 2813

SECTION 26 2816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS**PART 1 GENERAL****1.01 RELATED DOCUMENTS:**

- A. Documents: Drawings, General Conditions of the Contract and Division 01 Sections apply to this Section
- B. Section 16180: Fuses

1.02 SUMMARY:

- A. This Section includes the following individually mounted, enclosed switches and circuit breakers:
 1. Fusible switches.
 2. Non-fusible switches.
 3. Molded-case circuit breakers.
 4. Molded-case switches.
 5. Enclosures.

1.03 DEFINITIONS

1. GD: - General Duty
2. GFCI: - Ground-Fault Circuit Interrupter
3. HD: - Heavy Duty
4. RMS: - Root Mean Square
5. SPDT: - Single Pole, Double Throw
6. HID - High Intensity Discharge

1.04 SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
 1. Enclosure types and details for types other than NEMA 250, Type 1.
 2. Current and voltage ratings.
 3. Short-circuit current rating.
 4. UL Listing for series rating of installed devices.
 5. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Field Quality-control test reports including the following:
 1. Test procedures used.
 2. Test results that comply with requirements.
 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- D. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition, include the following:
 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
 2. Time-current curves, including selectable ranges for each type of circuit breaker.

PART 2 PRODUCTS**2.01 FUSIBLE AND NON-FUSIBLE SWITCHES:**

- A. Manufacturers:
 1. Eaton Corporation; Cutler-Hammer Products.
 2. General Electric Co.; Electrical Distribution & Control Division.

3. Siemens Energy & Automation, Inc.
 4. Square D/Group Schneider.
- B. Fusible switch, NEMA KS 1, Type HD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- C. Non-fusible switch, NEMA KS 1, Type HD, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- D. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.
 3. Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades open.

2.02 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES:

- A. Manufacturers:
1. Eaton Corporation; Cutler-Hammer Products.
 2. General Electric Co.; Electrical Distribution & Control Division.
 3. Siemens Energy & Automation, Inc.
 4. Square D/Group Schneider.
- B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 150 A and larger.
 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front mounted, field adjustable trip setting.
 3. Electronic Trip-Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short –time pickup levels.
 - c. Long- and short –time adjustments.
 - d. Ground-fault pickup level, time delay, and I^2t response.
 4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
 5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
 6. GFCI Circuit Breakers: Single- and two-pole configurations with 5 mA trip sensitivity.
- C. Molded-Case Circuit Breaker Feature and Accessories:
1. Standard Frame sizes, trip ratings, and number of poles.
 2. Lugs: Mechanical style suitable for number, size, trip ratings, and conductor material.
 3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment, Type HID for High Intensity Discharge lighting loads.
 4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
 5. Ground Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings push-to-test feature and ground fault indicator.
 6. Auxiliary Switch: Two SPDT switches with “a” and “b” contacts; “a” contacts mimic circuit-breaker contacts, “b” contacts operate in reverse of circuit-breaker contacts.
- D. Molded-Case Switches: Molded-case circuit breaker with fixed, high-set instantaneous trip only, and

short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

- E. Molded-Case Switch Accessories:
 - 1. Verify that accessories retained below are available and appropriate for molded-case switch types and ratings retained.
 - 2. Lugs: Mechanical style suitable for number, size, trip ratings, and material of conductors.
 - 3. Application Listing: Type HACR for heating, air-conditioning, and refrigerating equipment.
 - 4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage. Provide "dummy" trip unit where required for proper operation.

2.03 ENCLOSURES

- A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.
 - 1. Outdoor Locations: NEMA 250, Type 3R.
 - 2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.
- B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.
- C. Comply with mounting and anchoring requirements specified in Division 16 Section "Electrical Supports and Seismic Restraints."
- D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.03 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Electrical Identification."
- B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Division 16 Section "Electrical Identification."

3.04 ADJUSTING

- A. Set field-adjustable switches and circuit-breaker trip ranges in accordance with overcurrent device study (see Division 16 Section "Overcurrent Protective Device Study").

3.05 CLEANING

- A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.
- B. Inspect exposed surfaces and repair damaged finishes.

END OF SECTION 26 2816

SECTION 26 2817 - DISCONNECTS**PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Safety switches and disconnects and separately mounted circuit breakers.
- B. Provide shop drawing.

PART 2 - PRODUCTS**2.01 DISCONNECT SWITCHES**

- A. Heavy duty rated 250 or 600 volts as required; quick-make, quick-break operation; horsepower rated. If switch is not available with proper horsepower rating, classify switch as isolating switch only and provide nameplate reading "DO NOT OPEN UNDER LOAD". Operating handle interlocked with switch door to prevent opening door with switch closed. Provide mechanical over-ride for authorized personnel to open switch door without operating switch handle.
- B. Fusible or non-fusible as shown. Furnish Bussman "Fuse-Tron" fuses for each fusible position, size as shown. Furnish 3 spare fuses for each size.
- C. Furnish with provisions for locking with padlock. Enclosures for switches NEMA 1, general purpose, NEMA 3R, raintight, or special enclosure, as shown.
- D. Standard product of Siemens, Square "D", General Electric, or Cutler Hammer.

2.02 SEPARATELY MOUNTED CIRCUIT BREAKERS

- E. Furnish and install separately mounted circuit breakers for overcurrent protection of feeders and branch circuits where shown on drawings.
- F. Circuit breakers: Thermal-magnetic, molded case type, rated 600 volts, with interrupting rating of 22,000 rms amperes symmetrical minimum at 208 volts.
- G. Individual circuit breakers shall be mounted in NEMA 1, general purpose surface or flush enclosures as shown.
- H. Circuit breakers shall be the standard product of G.E., Siemens, Square "D" or Cutler Hammer.
- I. Lock-able switch.

PART 3 - EXECUTION

- A. Secure disconnect switches to building or equipment surface as shown. If location shown is not suitable for installing, provide Unistrut P-1000 rack mounted as directed to secure switch.
- B. Disconnects shall be located to be accessible and within 5 feet or closer to equipment served.

- C. Provide engraved nameplates identifying equipment served, fuse or breaker size. Refer to Specification Section 16014.

END OF SECTION 26 2817

SECTION 26 5000 – LIGHTING**PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Furnish and install all lighting luminaires, with all necessary accessories and lamps, as shown, specified, and/or scheduled.

1.02 RELATED SECTIONS

- B. See Section for Lighting Control Systems.
- C. See Section 16010 or Section 16012 for requirement for submittals.
- D. See Division 1 for allowances and Owner-furnished items to be installed under this Section.

1.03 ABBREVIATIONS

- E. H.I.D. - High Intensity Discharge (High Pressure Sodium, Mercury Vapor, Metal Halide)

1.04 SUBMITTALS

- F. Shop drawing submittals for luminaires shall include the following for each luminaire: complete construction details including all dimensions, complete description of materials used, complete electrical data (including operating voltage), photometric test report from an independent testing lab, complete description of finish, and manufacturer catalog cutsheet of lamp to be used.

PART 2 - PRODUCTS**2.01 LUMINAIRES:**

- A. Furnish and install luminaires as shown in luminaire schedule, or otherwise indicated on the drawings. Manufacturer catalog numbers shown are for general descriptive purposes only, and are intended only to establish the standard of quality.
- B. Locations of luminaires on electrical drawings are diagrammatic. Verify location of luminaires with architectural drawings prior to installation. Conflicts between electrical and architectural drawings shall be referred to the Architect for resolution.
- C. Provide luminaires complete with all options, accessories and other appurtenances required for a complete installation. Contractor shall verify type of ceiling and wall construction being installed, and provide luminaires properly configured for the type of construction.

- D. All luminaires shall be UL listed for the application being installed.
- E. Exit signs shall be furnished with 6" high letters with ¾" stroke. Verify color of signage required by local code authorities. Signs shall meet all NFPA, UL and local building code requirements.
- F. Pendant stem mounted luminaires shall be furnished with ball aligner swivel, 30 degrees from vertical minimum, with swivel below canopy, with ½" diameter metal tube (stem).
- G. Plastic lenses and shielding shall meet NFPA and local building code requirements for light transmitting plastics.
- H. Metal luminaire housings shall be free of tool marks, dents, burrs and sharp edges. All metal parts shall be painted, galvanized, or otherwise corrosion-resistant.
- I. Reflector surfaces shall be finished specular, semi-specular, diffuse or painted as indicated. Specular finish materials shall have a minimum reflectance value of 83%. Semi-specular or diffuse finish shall have reflectance of 75% and white painted finish materials shall have reflectance of 88%.
- J. Luminaire support wires shall be zinc-coated, soft temper ASTM A641/A641M steel, 12 gage.
- K. Luminaires with aircraft cable suspension system shall use 1/16" diameter (minimum) stainless steel aircraft cable and adjustable cable gripper with swaged cable stop at ceiling canopy. Cable size shall be selected by luminaire manufacturer to provide adequate support.

2.02 BALLASTS AND TRANSFORMERS

- L. All ballasts and transformers used in luminaires shall be ETL approved and/or UL listed. Transformers for low-voltage lighting systems shall be UL listed for that application.
- M. Interior ballast noise level essentially quiet in normal ambient noise level.
- N. Provide fuse for each ungrounded conductor supplying each ballast or transformer.
 - 1. Fluorescent: provide GMF/HLR fuse of proper size/rating for each ballast.
 - 2. H.I.D.: provide HEB/KTK fuse of proper size/rating for each ballast.
- O. Ballasts provided to function without interruptions when operating in room ambient temperature of 80 degree F. and plenum operating temperature of 120 degree F.
- P. Luminaires installed in environments with ambient temperature below 32 degree F shall be provided with ballast appropriately rated for the ambient environment.
- Q. Ballasts for each lamp type shall use a consistent form factor for all luminaires throughout the project using that lamp type.

- R. Luminaires with ballasts that can be serviced in place shall incorporate a means to disconnect the conductors supplying the ballast in compliance with 2005 N.E.C. Article 410.73(G).

2.03 FLUORESCENT BALLASTS

- S. Electronic Ballast: Instant - start, std THD:
 - 1. Furnish fluorescent luminaires with rapid start lamps and high-frequency electronic ballast.
 - 2. Ballast shall be high frequency (20 khz or greater), operate lamp without detectable flicker and provide full light output. Ballast shall operate lamp within ANSI guidelines for lamp starting and lamp operation, Ballast shall be warranted for five (5)years. Ballast shall be "universal voltage" (able operate 120V or 277V.) Ballast shall incorporate circuiting to detect "end-of-life" of lamp and shut down ballast operation.
 - 3. Ballast shall comply with FCC and NEMA limits governing EMI and RFI, and shall not interfere with the operation of other electrical equipment. Total harmonic distortion shall be less than 20%. Power factor shall be greater than 0.95. Ballast/lamp combination shall meet the following (T8 lamps are used to establish level of performance. Provide ballast required to properly operate with lamp specified in luminaire schedule or as required by luminaire manufacturer):

- a T8 Lamps:

<u>Configuration</u>	<u>Ballast Factor</u>	<u>Ballast Efficacy Factor</u>
2-lamp	0.88	1.46
3-lamp	0.88	1.00
4-lamp	0.85	0.75

- 4. Approved Ballast Manufacturers:
 - a Advance, Osram/Sylvania, Howard Industries, Universal, Valmont.

- T. Fluorescent Architectural Dimming Ballasts:
 - 1. Dimmer/Ballast system shall be rated to control T-8, and T-5 lamps at 120 VAC. All lamps on the same circuit must have the same current rating (i.e., T-8), but may be different lengths (i.e., 3',4'). See luminaire schedule and/or dimming schedule for specific ballast model numbers. The dimming performance shall be as follows:
 - a Dimming range down to 1% light output (5% for T-5 twin tube lamps). Ballasts shall be capable of striking lamps at any light level without first flashing to full light.

- b One- and two-lamp ballasts track evenly, with no perceptible difference in light levels for the same type lamps.
- c Different lamp lengths on the same circuit shall track evenly, with no perceptible difference in light levels for the same type lamps.
- d Ballasts shall be inaudible with no apparent humming or buzzing at any point in the dimming range.(within a 27dB ambient noise sound level)
- e Ballasts shall have: a power factor greater than .95, ballast factor equal to .93, total harmonic distortion less than 10%, and lamp current crest factor less than or equal to 1.6. Ballasts must comply with FCC Part 18 regulations and shall not interfere with other properly installed electrical equipment.

2. Approved Product: Lutron Hi-Lume FDB series.

U. FLUORESCENT ENERGY-MANAGEMENT DIMMING BALLASTS:

- 1. Ballasts shall be Programmed Rapid Start, Series wired, THD<10%, minimum starting temperature of 0°F, maximum case temperature of 70°C.
- 2. Ballasts shall have a 2-wire 0-10Vdc interface compatible with industry standard 0-10V dimmers, daylight sensors, occupancy sensors, building automation systems and other industry standard controllers.
- 3. Ballasts shall have anti-flash circuitry that will start lamp in any light level mode without flashing to full light output. Light level output shall be continuous, even and flicker free over the entire dimming range.
- 4. Ballast dimming range for T8 lamps shall be 110%-5% for 1, 2 & 3-lamp T8 models, 110%-10% for 4-lamp T8 modes
- 5. Ballast dimming range for T5 lamps shall be 100%-1%. Ballast to provide dynamic end of lamp life sensing with auto-reset feature when lamps are changed.
- 6. Approved Ballast Manufacturers: Advance, Lutron, Universal, or Osram/Sylvania.

2.04 COMPACT FLUORESCENT BALLASTS

V. Electromagnetic Ballast (13 watt or less):

- 1. Compact fluorescent luminaires with pre-heat type lamps (integral starter) shall be furnished with compatible electromagnetic ballasts.

2. Ballast shall be equipped with UL recognized non-PCB containing capacitor, and a core and coil protector. Ballast shall be high power factor, UL listed Class P, and shall operate lamps within ANSI guidelines for lamp starting and operation.

W. Electronic Ballast (13 watt and higher):

1. Compact fluorescent luminaires with rapid start lamps (without integral starter) shall be furnished with programmed rapid start electronic ballasts.
2. Ballasts shall be series wired, THD<10%, minimum starting temperature of 0°F, maximum case temperature of 70°C, and allow remote mounting up to 18 feet. Ballast factor to be 0.95 –1.05 for Normal Light Output. Ballast input voltage shall be Universal Voltage (120V through 277V).
3. “Triple-tube” (aka. PLT, “hex” tube, or CFM) compact fluorescent lamps shall be furnished with electronic ballast that will operate 26, 32, or 42 watt lamps.
4. Approved ballast manufacturers: Advance, Universal, Robertson, Osram/Sylvania.

X. Compact Fluorescent Dimming Electronic Ballasts.

1. Electronic dimming ballast shall have a continuous flicker-free architectural dimming range of 100% - 1% relative light output (RLO) for T4 4-pin compact fluorescent lamps.
2. Electronic dimming ballast shall have:
 - a a ballast factor greater than .95
 - b total harmonic distortion (THD) less than 10% at full light output.
 - c Electronic dimming ballast shall utilize 3-wire (line voltage) phase control technology for ballast dimming.
3. Electronic dimming ballast shall maintain constant light output +/-2% for a line voltage variation of +/-10%.
4. Electronic dimming ballast shall not be damaged by miswires between any input power and control connections and any lamp leads to each other and/or ground.
5. Approved Product: Lutron Hi-Lume.

2.05 HIGH INTENSITY DISCHARGE BALLASTS

Y. Metal Halide:

1. Furnish Metal Halide luminaires with Auto-Regulating or Constant-Wattage Auto transformer ballast. Ballast shall be high power factor (PF > 0.9) and operate lamp within ANSI standards for lamp starting and operation. Ballast shall regulate lamp power within 10% with line voltage variation of +/- 10% and shall keep lamp energized with line voltage drop not exceeding 30%.
 2. Furnish pulse start luminaire / lamp system where indicated. Pulse start ballasts shall be linear-reactor on super CWA type.
- Z. Furnish High Pressure Sodium luminaires with Auto-Regulating ballast. High color-rendering High Pressure Sodium lamps shall be provided with magnetic regulating ballasts. Ballast shall be high power factor (PF > 0.9) and operate lamp within ANSI standards for lamp starting and operation. Ballast shall regulate lamp power within 3% with line voltage variation of +/- 10% and shall keep lamp energized with line voltage drop not exceeding 30%.
- AA. Approved HID Ballast Manufacturers:
1. Advance, Universal, Valmont, Venture.

2.06 LAMPS

- BB. Furnish lamps for all luminaires as specified in Luminaire Schedule, otherwise provide lamp as recommended by luminaire manufacturer.
- CC. Lamps shall be new, delivered to the project site in their original packing, and shall be of the same manufacturer for each luminaire type. Install lamps immediately prior to Owner's occupancy. Do not use lamps for construction purposes.
- DD. Warranty lamps as follows:
1. Incandescent - one month.
 2. Fluorescent and HID - one year
 3. Warranty begins from date of substantial completion.
 4. All lamps shall be free of defects and covered by an implied warranty based on industry - accepted lamp mortality. Lamps failing at a higher than normal rate shall be replaced upon determination of cause of failure or defeat.
- EE. Incandescent lamps:
1. Standard Shape A-lamp shall be medium base, 120 volt rated, inside frosted. Provide 120V lamps for dimmed circuits.
 2. PAR lamps shall be medium base, 120 volt rated quartz-halogen.

3. Provide 120 volt lamps for dimmed circuits. Use infrared (IR) conserving lamps whenever possible.
4. Low-Voltage Quartz-Halogen lamps shall be 12 volt with cover glass. Use Infrared (IR) conserving lamps whenever possible.
5. MR-16 lamps shall have metalized reflector to minimize color shift between lamps. Osram/Sylvania "Titan", or G. E. "Constant Color Precise".

FF. Fluorescent Lamps:

1. All fluorescent and compact fluorescent lamps shall be compatible with ballast provided with luminaires to operate lamp within ANSI and NEMA guidelines. Provide lamps with low mercury content (federal EPA TCLP compliant a.k.a. "ECO" or "ALTO").
2. T8 lamp type: lamps shall have an average rated life of 20,000 hours, minimum of 2800 lumens and 75 CRI.
3. Compact fluorescent (T4) lamp type: Compact fluorescent lamps shall either be single, double or triple tube type with 4-pin bases for operation on electronic and dimming ballasts. Where available lamps shall contain end-of-life sensing to prevent overheating of lamp base and sockets. Lamps shall have a minimum CRI of 82.
4. Compact fluorescent (T5) lamp type: Lamps shall have a 2G11 base and operate on electronic ballasts. Lamps shall have a minimum CRI of 82.
5. Linear T5 fluorescent lamp type: All linear T5 fluorescent lamp types shall have miniature bi-pin bases, 20,000 hours average rated life, a minimum CRI of 82.

GG. High Intensity Discharge (HID) Lamps:

1. All high intensity discharge lamps shall be operated on the appropriate ANSI designated electromagnetic ballast in accordance with ANSI C82.4.
2. Metal halide lamps: All metal halide lamps used in interior applications shall be coated, unless otherwise noted in the lighting fixture schedule. Otherwise, provide clear or coated lamp as recommended by luminaire manufacturer. All metal halide lamps used in open aperture luminaire shall contain a protective shroud / other suitable containment material for use in open fixtures ("O" rated).
3. High pressure sodium lamps: All HPS lamps shall have an average rated life of 24,000 + hours. All HPS lamps shall have a lead-free solderless base, to provide superior electrical contact in lampholder throughout lamp life.

- 4. Low pressure sodium lamps: All LPS lamps shall have a non-metallic bayonet base for safe re-lamping, sodium retaining reservoirs, U-bend insulation to control lamp wattage rise, arc tube support system to protect arc tube from shock and vibration, uniform indium oxide heat reflecting coating, barium getter, triple coil electrodes and a fuse coil in the lamp base.

HH. Approved Lamp Manufacturers:

- 1. General Electric, Osram/Sylvania, Philips, Venture.

2.07 EMERGENCY LIGHTING:

II. Provide luminaires and exit signs with self-contained battery power supplies as indicated. All equipment shall conform to UL924-Emergency Lighting and Power Equipment.

JJ. Battery shall be sealed, maintenance-free lead-acid type (indoors) or nickel-cadmium (outdoors or unconditioned spaces) with 10-year nominal life. Unit shall incorporate a fully-automatic solid state charger and automatic transformer relay to transformer to backup battery power supply upon failure of normal power.

KK. Fluorescent emergency ballasts shall be self-contained battery-inverter units mounted within the luminaire housing. In emergency operation, lamps shall operate continuously for a minimum of 90 minutes. Once normal power is restored, the unit shall automatically transfer to charging mode. The ballast shall produce light output (minimum) as follows:

<u>Lamp Type</u>	<u>Lumen Output</u>
F32T8	1350 Lumens
FT40	900 lms
CFM42W/32W	750 lms
CFQ26W	600 lms

LL. All emergency lighting equipment shall be equipped with means to test operation and an LED indicating battery status.

MM. H.I.D. luminaires indicated for use as emergency lighting shall be provided with an auxiliary system to produce light instantly when the primary lamp momentarily extinguishes or is being initially energized ("quartz restrike"). The auxiliary system shall consist of an incandescent quartz-halogen lamp socket, time-delay relay, and current-sensing device so that the auxiliary lamp turns off once the primary lamp reaches 60% of normal light output.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Support luminaires from structure of the building, independent from the ceiling membrane or finish material. Luminaire shall be set level, plumb, and square with ceilings and walls.
- B. Recessed lay-in luminaires in suspended grid ceilings shall be supported from the ceiling grid. Provide devices for securing the luminaire to the ceiling grid to comply with the National Electrical Code ("earthquake clips"). Luminaires heavier than 30 pounds shall have supplemental support wires anchored to the structure above the ceiling. Provide independent support wires, anchored to structure above and attached to fixture at each corner.
- C. Recessed luminaires in fire-rated ceiling assemblies shall be installed in accordance with the UL listing of the assembly.
- D. Recessed luminaires (non lay-in or hard ceiling types) shall be supported by $\frac{3}{4}$ " steel ceiling channel, or factory-supplied hanger bars one on each side of the luminaire, anchored to ceiling structure. Recessed luminaires heavier than 20 pounds shall have supplemental support anchored to the structure above the ceiling. Do not use conduit to support luminaire.
- E. Provide recessed luminaires with appropriate frames, hardware and trim for the ceiling installed.
- F. Install luminaires free and clear of structural and mechanical interferences above the ceiling. If location indicated on the drawing conflicts with other elements, notify the Architect for directions for remedial action.
- G. Attach surface and pendant mounted luminaires to 3/16" fixture stud in outlet box. Luminaires in excess of 20 pounds shall have supplemental support anchored to the structure above the ceiling.
- H. Luminaires surface mounted to grid-type ceilings shall be mounted with Caddy IDS type clips anchored to structure above.
- I. Wall mounted luminaires shall be anchored to wall structure. Luminaire shall fully conceal the outlet box.
- J. Wiring to luminaires shall be with flexible metallic conduit to junction box. Do not wire luminaire to luminaire unless noted otherwise, or if using manufactured wiring systems.
- K. Individual flexible connections under 6 feet in length shall consist of 2#14 and 1#14 (ground) in 3/8" flexible metallic conduit (for circuits 20A or less). Bond ground wire and conduit at each end.
- L. Recessed luminaires in insulated ceilings shall be installed so that insulation is no less than 3 inches away from the fixture enclosure unless the luminaire is listed for direct contact with insulation (IC rated).
- M. Provide equipment, labor and materials, as needed for final aiming of adjustable luminaires. Aiming shall take place immediately before final occupancy by the Owner.

- N. Reflectors, trim cones, and other visible trim of luminaires shall not be installed until completion of ceiling work, and shall be clean and free of dust, fingerprints, scratches, dents etc. upon substantial completion.

END OF SECTION 26 5000