

**PROJECT MANUAL FOR
THE CONSTRUCTION OF**

**GILEAD-BLOOMFIELD COMPLEX RENOVATION
MACON-BIBB COUNTY
1931 ROCKY CREEK ROAD
MACON, GEORGIA 31206**

OWNER:

MACON-BIB COUNTY
MACON-BIBB COUNTY RECREATION DEPARTMENT
150 WILLIE SMOKE GLOVER DRIVE
MACON, GEORGIA 31201

ARCHITECT:

SIZEMORE GROUP, LLC
1700 COMMERCE DRIVE
ATLANTA, GEORGIA 30318
404-605-0690

STRUCTURAL ENGINEER:

FORSITE GROUP
NORCROSS, GEORGIA

MECHANICAL/ELECTRICAL/PLUMBING ENGINEERS:

NOTTINGHAM, BROOK & PENNINGTON
MACON, GEORGIA

HARDWARE CONSULTANT:

PHILLIPS-LANGLEY & ASSOCIATES
SUWANNEE, GEORGIA

SPECIFICATION CONSULTANT:

SPIKER BALDWIN ASSOCIATES, INC.
DECATUR, GEORGIA

JANUARY 29, 2016

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SECTION 01 1100
SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY OF WORK:

- A. The scope of work includes renovations to the former Gilead Church building, the Middle School Building, the STEM Lab Building and the Gymnasium as follows:
1. Former Gilead Church: Remove existing rooftop HVAC equipment. Provide new metal framed cricket at roof valley and install new PVC roofing over entire roof.
 2. Middle School Building: Remove existing brick planter and flagpoles at entrance and provide new brick masonry column covers at existing canopy. Patch asphalt after removing planter. Replace all exterior windows and doors. Modify existing interior partitions to provide larger classrooms, office area, and handicapped accessible restroom. Install new doors, ceilings, lighting, HVAC units, interior finishes and millwork.
 3. STEM Lab Building: Replace all exterior doors and roofing. Provide new ceilings, lighting, HVAC units, and interior finishes.
 4. Gymnasium: Install new PVC roofing over entire existing pre-engineered metal building roof and paint exterior walls. Renovate existing locker rooms with new handicapped accessible toilet stalls. Convert former classrooms into new exercise rooms by modifying the existing concrete block partitions and installing new exterior doors, ceilings, lighting, HVAC units, and interior finishes.

1.2 USE OF PREMISES:

- A. Limit site disturbance, including earthwork and clearing of vegetation, to 40'-0" beyond building perimeter; 10'-0" beyond surface walkways, patios, surface parking, and utilities less than 12" in diameter; 15'-0" beyond primary roadway curbs and main utility branch trenches; and 25'-0" beyond constructed areas with permeable surfaces (such as pervious paving areas, stormwater detention facilities, and playing fields) that require additional staging areas in order to limit compaction in the constructed area.

1.3 WORK RESTRICTIONS:

- A. Work restrictions, general: Comply with restrictions on construction operations.
- B. Public streets:
1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
 2. Keep fire lanes clear. Emergency vehicles shall access to the building and project site at all times during construction.
- C. Nonsmoking building: Smoking is not permitted within the building or within 25'-0" of entrances, operable windows, or outdoor-air intakes.
- D. Controlled substances: Use of tobacco products and other controlled substances on Project site is not permitted.

1.4 OWNER FURNISHED, OWNER INSTALLED WORK (OFOI):

- A. The following work will be provided by the Owner under separate contracts. Contractor shall install outlet boxes and conduits with pull strings at the ceiling plenum as indicated on electrical drawings.
1. Telephone system.
 2. Security system.

1.5 OWNER FURNISHED, CONTRACTOR INSTALLED WORK (OFCI):

- A. The following work will be furnished by Owner and to Contractor for installation by Contractor. Contractor shall coordinate delivery of materials to project site. Contractor shall include cost of installation in Contract Amount.
1. Sound system including design.
 2. Television monitors and mounting brackets.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

End of Section

SECTION 01 2513

PRODUCT SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY:

- A. Related work specified elsewhere:
 - 1. Product Requirements section, Paragraph 1.2, A. Product Quality Assurance.

1.2 PRODUCT SUBSTITUTION PROCEDURES:

- A. Products are specified by reference standards, performance and manufacturer's name and model number or trade name.
 - 1. When specified only by reference standard or performance, Contractor may select any product meeting specified standards or performance requirements, by any manufacturer.
 - 2. When several products or manufacturers are specified as being acceptable, Contractor has the option of choosing among those named.
 - 3. When one product or manufacturer is specified or indicated as the "basis of design", "basis of selection" or "scheduled", Contractor shall bear costs associated with changes required for application or installation of other products or assemblies.
 - 4. When proprietary products are specified, substitutions will be allowed only by substitution provisions specified herein, unless it is specifically stated that no substitutions are allowed.
- B. If it is desired to use products different from those indicated in the Contract Documents, the party requesting the substitution shall make written application on form provided at the end of this section and as described herein. The burden of proving equality of proposed substitutions rests with the party making the request for substitution.
 - 1. Requests for substitution shall reach Architect not less than ten days prior to date set for opening of bids. Requests received by Architect after this date will not be considered.
 - 2. Requests for substitution shall be accompanied by research and/or test reports evidencing compliance with building code in effect for Project, from ICC-ES or other independent testing laboratory located in the United States.
 - 3. Requests for substitution shall be accompanied by such technical data and samples as the party making the request desires to submit. Architect will consider reports from independent testing laboratories, verified experience records from previous users, and other printed or written information valid in the circumstances.
 - 4. Requests for substitution shall indicate in what respects proposed materials or products differ from those specified and the effect on interfacing or related work.
 - 5. Requests for substitution shall be accompanied by the manufacturer's dated product data describing the installation, use and care, as applicable, of proposed substitution. Include reference standards, test data and clarification drawings.

6. Requests for substitution shall be accompanied by complete cost data indicating material cost, installed cost and savings, if any, resulting from proposed substitution.
 7. Determination as to acceptability of proposed substitutions will be made based only on data submitted.
 8. Contractor shall coordinate installation of accepted substitutions with interfacing work, bearing re-design costs and making approved changes in the Work to properly incorporate the substitutions, and shall waive all claims for additional costs related to use of acceptable substitutions which become apparent following acceptance.
 9. Contractor shall be responsible for payment of time for research, evaluation, selection and re-design costs incurred by Architect and his consultants for substitutions.
- C. An addendum will be issued to Bidders not less than four days prior to the date set for opening of Bids if a proposed substitution is accepted by Architect. Unless substitutions are received and approved as described above, the successful Bidder shall be responsible for furnishing materials and products in accord with the Contract Documents.
- D. In the event that specified items cannot be delivered to the job site and incorporated into the Work at such times and in such quantities as to cause no delay, then Contractor may request a substitution in the manner described above. Should the accepted substitution provide a cost savings, the Contract price will be adjusted by Change Order, with Owner receiving the benefit of the net savings. No increase in the Contract price will be allowed on substitutions made after the receipt of Bids, except where the Contractor can verify a timely placement of orders appropriate to the materials and conditions involved.
- E. Inability to obtain specified items due to Contractor's failure to place timely orders will not be considered reason for authorizing substitutions.

End of Section

SUBSTITUTION REQUEST FORM

NOTE: This form is for use by Prime Construction Contractor only. Submittals by others will be returned with no response.

PROJECT: _____

LOCATION: _____

OWNER: _____

DATE: _____

We hereby submit for your consideration the following substitution instead of the item specified or shown on the drawings:

Section:	Paragraph:	Specified Item:
_____	_____	_____

Proposed Substitution:

Submit research and/or test reports evidencing compliance with building code in effect for Project, from ICC-ES or other independent testing laboratory located in the United States.

Submit manufacturer's certification that products to be supplied to this project have been manufactured in accord with the product requirements contained in the Product Requirements section of the Project Manual.

Attach complete product data, drawings and descriptions of product, with fabrication and installation details. Provide laboratory tests if applicable.

Provide sample, if applicable. Indicate if sample will be provided under separate cover.

Include complete information on changes to drawings and/or specifications that proposed substitution will require for its proper installation.

Fill in blanks below: (Include attachments if space is insufficient. Failure to provide information will void submittal.)

- A. Reason(s) for proposed substitution: (check all that apply):
- ___ 1. Request is equivalent to product/material/ assembly specified. (Note: Attach technical documentation.)

- 2. Specified product or method cannot be provided within the Contract Time. (Note: This request will not be considered if the product or method cannot be provided as a result of the Contractor's failure to pursue the work promptly, or to coordinate the various activities properly, or if the Contractor fails to place timely orders.)
- 3. Specified product or method cannot receive necessary approval by a governing authority, and the Contractor certifies that the requested substitution can be approved.
- 4. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting redesign and evaluation costs and the increased cost of other work by the Owner or separate contractors, and similar considerations.
- 5. Specified product or method cannot be provided in a manner which is compatible with other materials of the work, and the Contractor certifies that the substitution will overcome the incompatibility.
- 6. Specified product or method cannot be properly coordinated with other materials in the work, and the Contractor certifies that the proposed substitution can be properly coordinated.
- 7. Specified product or method cannot receive a warranty as required by the Contract Documents, and the Contractor certifies that the proposed substitution can receive the required warranty.

B. Does the substitution affect dimensions or details shown on drawings:

No.

Yes. (Attach marked up prints of drawings showing changes required.)

C. What effect does the substitution have on other trades?

D. Compare significant qualities of proposed substitution with those of work or product originally specified or shown on drawings. Include elements such as size, weight, durability, performance, visual effect, etc.

E. Coordination information. Include all changes required in other elements of the work in order to accommodate the substitution, including work performed by the Owner or separate contractors.

F. State effect the substitution will have on the work schedule in comparison to the schedule which would prevail without the proposed substitution. State the effect of the proposed substitution on the Contract Time.

G. Provide complete cost information, including a proposal of any net change in the Contract Amount.

H. Manufacturer's warranties of the proposed and specified items are:

Same Different (explain on attachment)

The Undersigned Contractor certifies its opinion that, after thorough evaluation, the proposed substitution will result in work that in every significant respect will be equivalent to or superior to the work required by the original Contract Documents and that it will perform adequately in the application indicated. Rights to additional payment or time because of failure of the substitution to perform adequately are hereby waived.

The Undersigned hereby agrees to pay in full for any changes to design, including detailing and engineering costs caused by the requested substitution.

Submitted by: NOTE: Submittal void and will be discarded if unsigned or if signed by entity other than General Construction Contractor.

Signature: _____

(Contractor's Authorized Representative)

(Title)

Contractor's Firm Name: _____

Date: _____

For use by Architect:

Accepted Accepted as Noted
 Not Accepted Received Too Late

By: _____
(Signature and printed name)

Date: _____

Remarks: _____

End of Form

SECTION 01 3300
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY:

- A. Definitions:
 - 1. Submittals: General term including samples, shop drawings and product data, as applicable.
 - 2. Shop drawings: Drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.
 - 3. Product data: Illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.
 - 4. Samples: Physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.
- B. Shop drawings, product data, samples and similar submittals are not Contract Documents. Their purpose is to demonstrate the way the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which submittals are required.
- C. General provisions:
 - 1. Provisions in this section are mandatory procedures for preparing and submitting shop drawings, product data, samples, and similar submittals.
 - 2. Shop drawings, product data, samples and similar submittals shall be in orderly sequence and timed to cause no delay in the Work.
 - 3. Job delays occasioned by requirement of resubmission of samples, shop drawings and product data not in accord with Contract Documents are Contractor's responsibility and will not be considered valid justification for extension of Contract time.
 - 4. Commence no portion of work requiring a submittal until submittal has been reviewed and stamped by Architect.

1.2 SUBMITTAL SCHEDULE:

- A. At least five days prior to date of pre-construction conference, submit a list of all required submittals, by specification section. Indicate timing for submission of required submittals and relation to construction sequence.
- B. During course of the Work, maintain an updated submittal schedule showing status of all submittals. Provide copies for Architect's information at project meetings and at other times when requested.

1.3 ADMINISTRATIVE REQUIREMENTS:

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
- B. Electronic submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
 4. Transmittal form for electronic submittals: Use form acceptable to Architect and Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.
 - g. Names of subcontractor, manufacturer, and supplier.
 - h. Category and type of submittal.
 - i. Submittal purpose and description.
 - j. Specification Section number and title.
 - k. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - l. Drawing number and detail references, as appropriate.
 - m. Location(s) where product is to be installed, as appropriate.
 - n. Related physical samples submitted directly.
 - o. Indication of full or partial submittal.
 - p. Transmittal number, numbered consecutively].
 - q. Submittal and transmittal distribution record.
 - r. Other necessary identification.
 - s. Remarks.
- C. Options: Identify options requiring selection by Architect.
- D. Deviations: Identify deviations from the Contract Documents on submittals.
- E. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- F. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

- G. Use for construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES:

- A. Electronic submittals:
1. Submit electronic submittals via email as PDF electronic files. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 2. When requested by Architect, post electronic submittals as PDF electronic files directly to Architect's FTP site specifically established for Project.
- B. Product data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. Include product manufacturer's standard printed material, dated, with product description and installation instructions indicated. Product data may also contain test and performance data, illustrations and special details.
 2. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as shop drawings, not as product data.
 3. Mark each copy of each submittal to show which products and options are applicable.
 4. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 5. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 6. Submit product data before or concurrent with samples.
 7. Submit product data in the following format: PDF electronic file.
- C. Shop drawings: Prepare project-specific information, drawn to scale. Do not base shop drawings on reproductions of Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction.

- G. Installer certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in Contract Documents and, where required, is authorized by manufacturer for this specific project.
- H. Manufacturer certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in Contract Documents. Include evidence of manufacturing experience where required.
- I. Product certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in Contract Documents.
- J. Material certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in Contract Documents.
- K. Material test reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in Contract Documents.
- L. Product test reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- M. Research reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for project.
- N. Preconstruction test reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in Contract Documents.
- O. Compatibility test reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- P. Field test reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in Contract Documents.
- Q. Design data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW:

- A. Action and informational submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval stamp: Stamp each submittal with a uniform, approval stamp. Include project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
- C. Review for compliance with the Contract Documents, stamp with approval and submit to Architect shop drawings, product data, samples and similar submittals required by Contract Documents in accord with submittal schedule approved by Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in activities of Owner or of separate contractors.
- D. By submitting shop drawings, product data, samples and similar submittals, Contractor represents to Owner and to Architect that Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements, and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with requirements of the Work and of the Contract Documents.
- E. The Work shall be in accord with approved submittals except that Contractor shall not be relieved of responsibility for deviations from requirements of Contract Documents by Architect's review of shop drawings, product data, samples or similar submittals unless Contractor has specifically informed Architect in writing of such deviation at the time of submittal and (1) Architect has given written acceptance to the specific deviation as a minor change in the Work or (2) a Change order or Construction Change directive has been issued authorizing the deviation. Contractor shall not be relieved of responsibility for errors or omissions in shop drawings, product data, samples or similar submittals by Architect's review thereof.
- F. Contractor shall direct specific attention, in writing or on resubmitted shop drawings, product data, samples or similar submittals, to revisions other than those requested by Architect on previous submittals. In the absence of such written notice, Architect's approval of a resubmission shall not apply to such revisions.
- G. When professional certification of performance criteria of materials, systems or equipment is required by Contract Documents, Architect shall be entitled to rely upon the accuracy and completeness of such calculations and certifications.
- H. Where work is indicated "By Others," Contractor shall indicate responsibility for providing and coordinating such work, whether by Subcontractors or under separate contracts.

- I. Contractor agrees that submittals processed by Architect are not Construction Change Directives or Change Orders; that purpose of submittals by Contractor is to demonstrate that Contractor understands design concept; that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and by detailing fabrication and installation methods he intends to use.
- J. Contractor represents by submitting samples, shop drawings and product data that he has complied with provisions herein specified. Submissions made without Contractor's approval indicated thereon will be returned without being reviewed for compliance with this requirement.
- K. Perform no portion of the Work for which Contract Documents require submittal and review of shop drawings, product data, samples or similar submittals until the respective submittal has been reviewed by Architect. Such work shall be in accord with submittals bearing Architect's stamp.

3.2 ARCHITECT'S ACTION:

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
 - 1. Architect's review, approval or other appropriate action is only for checking for conformance with information given and the design concept expressed in Contract Documents. Architect's acceptance of a specific item shall not indicate acceptance of an assembly in which the item is a component.
 - 2. Architect's review of Contractor's submittals shall not relieve Contractor of responsibility for deviation from requirements of Contract Documents unless Contractor has informed Architect in writing of such deviation at time of submission and Architect has given written acceptance to the specific deviation. Architect's review shall not relieve Contractor from responsibility for errors or omissions in submittals.
 - 3. Informational submittals required to be submitted "For Architect's Information Only" are required to demonstrate that the Work complies with performance requirements of Contract Documents. Such submittals, if acceptable to Architect, will not be returned to Contractor.
- B. Action submittals: Architect will review each submittal, mark it with appropriate action, corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- C. Informational submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by Contract Documents may not be reviewed and may be discarded.

End of Section

SECTION 01 7329
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY:

- A. Contractor's responsibilities:
 - 1. Contractor shall be responsible for cutting, fitting and patching required to complete the work and as follows:
 - a. Make new and existing parts fit together.
 - b. Provide penetrations of existing structural, non-structural, mechanical and electrical elements and surfaces for installation of new materials and products. Provide shop drawings or other appropriate submittals for each structural penetration, as herein specified.
 - c. Restore penetrations of existing structural, non-structural, mechanical and electrical elements and surfaces in accord with accepted submittals. Restoration materials shall be similar to those removed or disturbed and/or materials and products as specified.
 - d. For structural, mechanical and electrical penetrations and disturbances, engage the services of a professional Engineer registered in the State of Georgia for all aspects of the work. Submittals shall bear the Engineer's seal.
 - 2. In addition to Contract requirements, upon written instructions of Architect:
 - a. Uncover work to provide for observation of covered work.
 - b. Remove samples of existing installed materials for testing and for matching of new materials.
 - c. Remove work to provide for alteration, restoration or refinishing of existing work.
 - 3. Do not endanger work by cutting or altering work.
 - 4. Do not cut or alter work not of this Contract without written consent of Owner.
- B. Costs incurred for ill-timed work or uncovering of work shall include costs for services of Owner's consultants.
- C. Related work specified elsewhere:
 - 1. Temporary facilities and controls.
 - 2. Product requirements.
 - 3. Selective demolition.

1.2 SUBMITTALS:

- A. Shop drawings, calculations, product data and samples:
 - 1. Submit shop drawings, calculations, product data and samples for structural, mechanical and electrical penetrations and disturbances. Indicate existing conditions, extent of cutting and patching work required, and restoration of elements to accommodate new work. Include concrete mixes, structural steel and reinforcement, wiring, conduit, piping, ductwork, fixtures and other engineering elements required for completion of new work.
 - 2. Submittals shall bear the seal of an Engineer licensed in the State of Georgia.

- B. Cutting/patching request:
1. Submit a written request to Architect, well in advance of executing cutting or alteration, which affects the following and are not indicated on the drawings:
 - a. Work of Owner or any separate Contract.
 - b. Structural value or integrity of any element of project.
 - c. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
 - d. Efficiency, operational life, maintenance or safety of operational elements.
 - e. Visual qualities of sight-exposed elements.
 2. Request shall include:
 - a. Identification of project.
 - b. Description of affected work.
 - c. Necessity of cutting or alteration.
 - d. Effect of work on Owner or separate Contract, or on structural or weatherproof integrity of project.
 - e. Description of proposed work:
 - 1) Description of cutting, patching or alteration.
 - 2) Trades who will execute the work.
 - 3) Products proposed to be used.
 - 4) Extent of work to be done.
 - f. Alternatives to cutting and patching.
 - g. Cost proposal, when applicable.
 - h. Written permission of separate Contractors whose work will be affected.
 3. Should conditions of the work or the schedule indicate a change of products from the original installation, Contractor shall submit a request for substitution as specified in Product Substitution Procedures section.
 4. Submit a written notice to Architect designating date and time work will be uncovered.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Materials for replacement of work removed: Materials shall be similar to those removed or disturbed and shall comply with specification sections for type of work to be performed.
- B. Comply with requirements specified in other Sections.
 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with requirements in Sustainable Design Requirements section.
- C. In-place materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 CUTTING AND PATCHING:

- A. Pre-cutting and patching conference: Review cutting and patching work with Architect and affected subcontractors as a part of pre-construction conference and monthly progress meetings.
- B. Examination:
 - 1. Examine existing conditions of the project, including elements subject to damage or to movement during cutting and patching.
 - 2. After uncovering work, inspect conditions affecting installation of products or performance of work.
 - 3. Report unsatisfactory or questionable conditions to Architect in writing; do not proceed with work until Architect has provided further instructions.
- C. Preparation:
 - 1. Provide adequate temporary support to ensure the structural value or integrity of the affected portion of the work.
 - 2. Provide devices and methods to protect other portions of the project from damage.
 - 3. Provide protection from the elements for that portion of the project which may be exposed by cutting and patching work. Maintain excavations free from water.
- D. Performance:
 - 1. Execute cutting, patching and demolition by methods which will prevent damage to other work and will provide surfaces to receive installation of repairs.
 - 2. Execute work by methods which will prevent settlement or damage to other work.
 - 3. Elements of a structural or support nature, including concealed elements exposed by the removal of existing elements of the work, shall be inspected and the Architect notified should additional work be indicated due to loss of structural integrity, rot, rust, corrosion or other similar condition.
 - 4. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.
 - 5. Restore work which has been cut or removed; install new products to provide complete work in accord with requirements of Contract Documents.
 - 6. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces. Firestop penetrations through fire-rated construction as specified in Firestopping section.
 - 7. Refinish entire surfaces (as necessary) to provide an even finish to match adjacent finishes:
 - a. For continuous surfaces: Refinish to nearest intersection.
 - b. For an assembly: Refinish the entire unit.
 - 8. Repair damaged adjacent surfaces and finishes to original condition.
 - 9. Maintain integrity of fire-resistant and rated construction.
- E. Restoration:
 - 1. Remove existing elements of a particular visual nature with care and in such manner that maximum reuse is possible. Label, clean, protect and store to ensure reusability or reinstallation, as applicable, to as near original condition as possible.

2. Existing items of significant visual or operational value to Owner, not planned for reinstallation, shall be made available for Owner's retention for use in other work.
3. Repairs of visual or finish materials requiring new material shall be made using materials which will match existing work in type, size, texture and all other visual aspects as approved by Architect.
4. Comply with the requirements of the Product Requirements section for delivery, storage, handling and installation of materials.
5. Restore penetrations of existing structural, non-structural, mechanical and electrical elements and surfaces in accord with accepted submittals. Restoration materials shall be similar to those removed or disturbed and/or materials and products as specified.
6. Finish surfaces requiring removal and repair, but designated to receive a new finish obscuring the nature of the original surface, may be repaired using materials most expedient to the nature of the work and which will result in a uniform, sound finished new surface of at least equal strength to existing adjacent material replaced. Subsurfaces to receive the new finish shall be of like nature to existing surrounding surfaces and acceptable to new finish surfacing installer for receipt of new materials without extra surface preparation for the repaired area.
7. Wiring, conduit, pipe or other utility service elements shall be enclosed or recessed within the building elements or surfaces as approved by Architect with associated material removal and restoration as described above. This shall include both new elements and existing surface-mounted elements to be retained within finished area.

End of Section

SECTION 01 7410

CLEANING UP

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS:

- A. Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract.
 - 1. At completion of the work, remove waste materials, rubbish, tools, construction equipment, machinery and surplus materials from and about the Project.
 - 2. At the Date of Substantial Completion, turn over to Owner those tools, construction equipment, machinery and surplus materials specifically required by Contract Documents to be left for Owner's maintenance.
- B. If Contractor fails to keep project clean or to clean up prior to Date of Substantial Completion, the Owner may do so as provided in the General Conditions, and the Owner shall be entitled to reimbursement from the Contractor.

1.2 STORAGE AND DISPOSAL REQUIREMENTS:

- A. Combustible debris, rubbish and waste material:
 - 1. Provide adequate ventilation during use of volatile substances.
 - 2. Do not allow to accumulate within buildings or on project site.
 - 3. Store combustible debris, rubbish and waste material in covered metal containers. Remove from buildings and project site at end of each work period.
 - 4. Combustible debris, rubbish and waste material shall not be disposed of by burning on the project site.
 - 5. Comply with governmental and environmental regulatory requirements for disposal of combustible debris, rubbish and waste material.
- B. Noncombustible debris, rubbish and waste material:
 - 1. Do not burn or bury noncombustible debris, rubbish and waste material on project site.
 - 2. Comply with governmental and environmental regulatory requirements for disposal of noncombustible debris, rubbish and waste material.
- C. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains, on pavements, in gutters or on project site.
- D. Do not dispose of waste or cleaning materials containing materials harmful to plant growth on project site. As quickly as possible, clean up materials which are accidentally spilled.

PART 2 - PRODUCTS

2.1 CLEANING AGENTS:

- A. Cleaning agents:
 - 1. Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned.
 - 2. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

3. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 CLEANUP DURING CONSTRUCTION:

- A. Execute cleaning procedures to ensure that building, project site and adjacent properties are maintained free from debris and rubbish.
- B. Wet down materials subject to blowing. Do not throw waste materials from heights.
- C. Provide covered on-site containers for waste collection. Place all waste materials and rubbish in containers in an expeditious manner to prevent accumulation. Remove waste from project site when containers become full.
- D. Legally dispose of all waste materials, rubbish, volatile materials and cleaning materials off project site.
- E. Do not dispose of materials in waterways.
- F. Prior to start of finish painting, clean and maintain interior spaces in a "broom clean" state until Date of Substantial Completion. Protect newly finished and clean surfaces from contamination during cleaning operations.
- G. Do not allow accumulation of debris contributing to survival or spread of rodents, roaches or other pests.
 1. On a daily basis, remove debris containing food scraps.
 2. Contractor shall be responsible for securing services of a pest exterminator at no additional cost to the Owner.

3.2 FINAL CLEANING

- A. General requirements:
 1. Provide a level of cleanliness generally provided by commercial building maintenance organizations using commercial quality maintenance equipment and materials. Visually inspect finished surfaces and remove traces of soil, waste material, smudges, and other foreign matter. Remove paint droppings, spots, stains, and dirt from finished surfaces.
 2. Clean all finished surfaces in accord with manufacturer's product data and requirements specified in trade sections, prior to Date of Substantial Completion. All general and specific cleaning shall be performed prior to Contractor's request that the project or portion thereof be inspected for Substantial Completion.
 3. Remove dust, debris, oils, stains, fingerprints and labels from exposed interior and exterior finish surfaces, including glazing materials.
 4. Repair, patch and touch up marred surfaces to match adjacent finishes. Replace materials which cannot be repaired or patched.
 5. Clean disturbed areas of project site of debris:
 - a. Broom-clean paved surfaces. Remove oil and similar deleterious substances.
 - b. Remove debris from grassed and landscaped areas and from undisturbed areas.

6. Install cleaned or new filters if HVAC units were operated during construction period. Clean ducts, blowers and coils if units were operated without filters.
 7. Clean surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces.
 - a. To polished surfaces requiring routine application of buffed polish, apply polish as recommended by manufacturer of material being polished.
 - b. Clean and polish finish hardware.
 - c. Clean or replace filters of mechanical equipment.
 8. Cleaning materials:
 - a. Use materials which will not create hazards to health or property and which will not damage surfaces.
 - b. Use materials and methods that are recommended by manufacturer or fabricator of material being cleaned.
 9. Scheduling:
 - a. Schedule final cleaning in such a manner so as to enable Owner to accept a completely clean project.
 - b. Execute final cleaning prior to Substantial Completion.
- B. Interior cleaning:
1. Remove temporary protection, tags, labels and markings from materials, fixtures, accessories and equipment.
 2. Clean transparent and glossy materials to polished condition; remove foreign substances.
 3. Wash and polish both sides of glass.
 4. Polish reflective surfaces to clear shine.
 5. Clean switch and outlet plates, finish hardware, handrails and metal trim of smudges, paint and soiling.
 6. Clean aluminum, stainless steel, bronze and similar metals in compliance with instructions of metal manufacturer.
 7. Vacuum clean carpeted and similar soft surfaces.
 8. Clean resilient floors thoroughly with well-rinsed mop containing only enough moisture to remove surface dirt and dust; then buff dry by machine, bringing surfaces to sheen.
 9. Clean tile in compliance with grout and tile manufacturer's recommendations.
 10. Broom clean and vacuum concrete floors.
 11. Clean under and behind convectors and other equipment.
 12. Clean inside cabinets and other concealed areas.
 13. Repaint surfaces and items that cannot be cleaned.
 14. Clean equipment and fixtures to a sanitary condition.
- C. Exterior cleaning:
1. Remove debris, waste and surplus materials from site and adjacent streets and roads.
 2. Remove temporary protection and temporary construction.
 3. Remove stains, spills and foreign substances from exterior surfaces.
 4. Employ window-cleaning firm or personnel experienced in window cleaning work. Clean interior and exterior of all glazing.
 5. Remove debris from roofs, gutters, downspouts, and drainage systems.
 6. Rake lawn areas and clean grounds.
 7. Sweep and hose down paving and walks.
 8. Clean exterior materials according to product manufacturer's directions.
- D. Cleaning mechanical and electrical equipment:
1. Clean surfaces of equipment; remove excess lubrication.
 2. Clean plumbing fixtures to sanitary condition.

3. Clean permanent filters of ventilating equipment and replace disposable filters when units have been operated during construction; in addition, clean ducts, blowers and coils when units have been operated without filters during construction.
 4. Light fixtures and lamps:
 - a. Wipe light fixtures with anodized aluminum louvers or reflectors free of dust, grease and fingerprints, using non-abrasive cloth and suitable cleaner, recommended by fixture manufacturer.
 - b. Replace burnt-out bulbs with new specified bulbs.
 - c. Replace construction bulbs with new specified bulbs.
- E. Disposal operations:
1. Remove recycling, waste and surplus materials, rubbish, and construction facilities from Site.
 2. Promptly and legally transport and dispose of any trash. Do not burn, bury, or otherwise dispose of trash on-site.
 3. Refer to Construction Waste Management and Disposal section for specific and additional requirements.

End of Section

SECTION 01 7700
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. Closeout includes general requirements in preparation for Final Completion and Final Payment. Closeout is directly related to Substantial Completion and may be a single time period for the entire work or a series of time periods for parts of the work accepted as substantially complete.

1.2 PREREQUISITES TO SUBSTANTIAL COMPLETION:

- A. Prior to requesting Architect's certification of Substantial Completion, complete the following and list known exceptions.
1. If Substantial Completion is being requested for a portion of the work, define such portion.
 2. Submit application for payment:
 - a. Submit sworn statement indicating 100 percent completion of work claimed as "Substantially Complete".
 - b. List incomplete items, value of incomplete work, and reasons for being incomplete.
 - c. Include documentation for completion.
 3. Indicate accounting changes to Contract Sum.
 4. Submit for that portion of the work:
 - a. Specific warranties.
 - b. Workmanship/maintenance bonds.
 - c. Maintenance agreements.
 - d. Final certifications.
 - e. Record drawings.
 - f. Maintenance manuals.
 - g. Project photographs, if pertinent to project activities.
 - h. Damage or settlement survey.
 5. Obtain and submit releases enabling:
 - a. Owner's use of the work.
 - b. Access to services and utilities.
 - c. Occupancy permits.
 - d. Operating certificates.
 6. Advise Owner of pending insurance change-over requirements.
 7. Obtain and submit operating certificates, final inspection/test certificates, and similar releases enabling Owner's full and unrestricted use of the work and access to services and utilities.
 8. Deliver tools, spare parts, extra stocks of materials, and similar physical items to Owner.
 9. Make final change-over of locks and transmit keys to Owner, and advise Owner's personnel of change-over in security provisions. Tag each key to indicate which lock key operates. Accompany keys with final hardware schedule, as specified in Door Hardware section.
 10. Complete start-up testing of systems and instruction of Owner's operating/maintenance personnel.
 11. Touch-up and otherwise repair and restore marred exposed finishes.
- B. Observation procedures:
1. Upon receipt of Contractor's request, Architect will either proceed with observation or advise Contractor of prerequisites not fulfilled.

2. Following initial observation, Architect will either prepare Certificate of Substantial Completion or advise Contractor of work which must be performed prior to issuance of certificate.
3. Re-observe when requested and assured the work has been substantially completed. If Architect and/or his consultants are required to perform more than two re-observations, Contractor shall be responsible for payment of time and costs incurred by Architect and his consultants for further re-observations.
4. Results of completed observation will form initial "punch list" for final acceptance.

1.3 PREREQUISITES TO FINAL ACCEPTANCE:

- A. General: Prior to requesting Architect's observation for certification of Final acceptance and Final payment, complete the following. List known exceptions.
 1. Indicate accounting changes to Contract Sum.
 2. Submit Final Application for Payment with:
 - a. Final releases.
 - b. Supporting documentation not previously submitted and accepted.
 - c. Certificates of insurance for Products and Completed Operations where required.
 3. Submit copy of Architect's Final Punch List. Contractor shall certify each item has been completed or resolved for acceptance.
 4. Submit final meter readings for utilities.
 5. Submit:
 - a. Specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents not submitted at time of Substantial Completion.
 - b. Record drawings and maintenance manuals not submitted at time of Substantial Completion.
 6. Submit consent of surety.
 7. Finishes manual:
 - a. Assemble a manual bound in hard cover binders, presenting for Owner's guidance full details of finish materials used in the building including care and maintenance.
 - b. Include a list of all finishes and their product names, numbers, colors, and cleaning and maintenance data. Include a list of installers and service representatives with company names and addresses, names of individual contacts, and telephone numbers.
 - c. Submit documents in suitable transfer cases indexed and marked for each division of the work.
 8. Submit executed contracts for extended maintenance or service required by Contract Documents to Architect for transfer to Owner.
 9. Revise and submit evidence of final (continuing) requirements.
 10. Complete final clean-up.
 11. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - a. Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
- B. Re-observance procedure:
 1. Upon receipt of Contractor's Notice that the work has been completed, including punch list items and excepting incomplete items delayed because of acceptable circumstances, Architect will observe the work.
 2. Upon completion of observation, Architect will either prepare certificates of Final Acceptance or advise Contractor of work not completed or obligations not fulfilled.

3. If necessary procedure will be repeated.

1.4 RECORD DOCUMENT SUBMITTALS:

A. General:

1. Unless otherwise required, furnish three complete sets of required documents.
2. Do not use required documents for construction purposes.
3. Protect from deterioration and loss in a secure fire resistive location.
4. Provide access to record documents.

B. Record drawings:

1. Maintain a blue-line set of Contract Drawings and shop drawings in clean, undamaged condition.
2. Mark up variations in the work as originally shown.
3. Mark drawing most capable of showing field condition.
4. Where shop drawings are used for mark-up, cross reference with Contract Drawings.
5. Mark with red erasable pencil and, where feasible, use other colors to distinguish categories of work.
6. Mark up new information of importance not shown on Contract Drawings or shop drawings.
7. Record work covered by subsequent construction or requiring removal of finish material should maintenance be necessary.
8. Note related Change Order numbers where applicable.
9. Organize Record Drawing sheets into manageable sets. Identify each set.
10. At completion of project, provide the following:
 - a. One full set of reproducible prints marked and noted with all variations and revisions. Provide reproducibles and two additional sets of prints made from the marked-up reproducibles.
 - b. Electronic copy of scanned documents marked and noted with all variations and revisions. Provide in pdf format, on CDs.
 - c. Indicate prints and electronic copies of drawings as Record Drawings.

C. Record Project Manual:

1. Maintain one copy of Project Manual, including addenda, Change orders, and similar modifications.
2. Mark up variations occurring in actual work.
3. Record substitutions and selection of options.
4. Cross reference with other documents.
5. Where feasible, mark up variations on blank left-hand pages of Project Manual, opposite original text.

D. Record product data:

1. Maintain one copy of each Product Data Submittal.
2. Mark up significant variations in actual work. Include:
 - a. Variations in product as delivered to site.
 - b. Variations from manufacturer's instructions and recommendations for installation.
3. Cross-reference with Change Orders and mark up Record Drawings and Specifications.

- E. Record sample submittal: Immediately prior to Date(s) of Substantial Completion, Architect will meet with Contractor at site, and determine which, if any, samples to be transmitted to Owner. Comply with Architect's instructions for packaging, identification marking, and delivery to Owner's sample storage place. Dispose of other samples.
- F. Maintenance and operating manuals:
 - 1. Organize maintenance and operating information into sets of manageable size. Manuals divisions shall match organization and location of specification sections indicated in Project Manual.
 - 2. Bind into heavy duty 3-ring binders, minimum 2" size, permanently identified and indexed with thumb tabs.
 - 3. Include:
 - a. Name of project, nature of information, Contractor/subcontractor and name and address of local parts supplier and service organization.
 - b. Emergency instructions.
 - c. Spare parts listing.
 - d. Warranties.
 - e. Wiring diagrams.
 - f. Recommend turn-around cycles.
 - g. Inspection procedures.
 - h. Applicable shop drawings.
 - i. Applicable product data.
- G. Miscellaneous record submittals:
 - 1. Refer to other sections of these specifications for requirements of miscellaneous record-keeping and submittals in connection with performance of the work.
 - 2. Immediately prior to Date(s) of Substantial Completion:
 - a. Complete miscellaneous records and place in good order.
 - b. Identify and bind or file.
 - c. make ready for continued use and reference.
- H. Inspection reports: Submit certificates from applicable local governmental agencies indicating that construction has been inspected as required by laws or ordinances and that project is approved for occupancy.
- I. Warranties: In accord with Contract Conditions, provide warranties as follows:
 - 1. Contractor shall furnish his warranty in writing.
 - 2. Forward each installer's warranty, in writing, on form bound herein.
 - 3. Forward manufacturers' and installers' warranties as specified in individual specification sections.
 - 4. Unless specifically indicated otherwise in individual sections, period for warranties shall begin on Date of Substantial Completion and shall continue for one year.
 - 5. Warranties shall state Date of Substantial Completion and date on which warranty expires.
 - 6. Assemble, bind, label and transmit warranties as required for other manuals above.
- J. Keys: Deliver at Date of Substantial Completion. Tag each key to indicate lock which key operates. Accompany keys with final hardware schedule, as specified in Finish Hardware Schedule.

1.5 OPERATING/MAINTENANCE INSTRUCTIONS AND DEMONSTRATIONS:

- A. Coordinate demonstrations and trial operations of equipment for Owner's designated personnel, and complete such demonstrations prior to Date of Final Acceptance. Each installer of work requiring maintenance or operation shall:
 - 1. Meet with Owner's personnel, at project site to provide basic instructions needed for proper operation and maintenance of the entire work.
 - 2. Provide instructions by manufacturer's representatives as required.
 - 3. Review maintenance manuals, record documentation, tools, spare parts and materials, lubricants, fuels, identification materials, control sequences, hazards, cleaning and similar procedures and facilities.
 - 4. Demonstrate start-up, shut-down, emergency operations, noise and vibration adjustments, safety, economy/efficiency adjustments, and similar operations.
 - 5. Review maintenance and operations in relation to warranties and similar continuing commitments.

- B. Demonstration and training video recordings: Submit on high resolution CDs or DVDs.
 - 1. Submit two copies within seven days of end of each training module.
 - 2. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name and address of videographer.
 - c. Name of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Date of video recording.

1.6 CONTINUING INSPECTIONS:

- A. Comply with Owner's request to participate in inspections at end of each time period required by specific warranties or similar components. Participate in general inspection of the work one year following Date of Substantial Completion.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

End of Section

SECTION 02 4119
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 PERFORMANCE REQUIREMENTS:

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

1.2 SUMMARY:

- A. Work included in this section:
 - 1. Removal of existing work to accommodate remodeling, renovation and restoration, as indicated on drawings.
 - 2. Protection of existing finished surfaces.
 - 3. Removal, storage, cleaning, restoration and reinstallation of existing items indicated to be reused in the finished work.
 - 4. Cleaning and restoration of existing work to remain.
- B. Related work specified elsewhere:
 - 1. Cutting and patching.
 - 2. Interior finishes.
 - 3. Doors and frames.
 - 4. Gypsum board.
 - 5. Acoustical ceilings.
 - 6. Masonry.
 - 7. Mechanical.
 - 8. Electrical.

1.3 SUBMITTALS:

- A. Calculations: Provide the services of a Structural Engineer licensed in the State of the project to recommend procedures to be used in the alteration or removal of any structural members not included in detail on drawings. Submit calculations and drawings sealed by engineer.
- B. Execution plan: Submit plan of execution for Owner's approval. Indicate locations of barricades, dust and noise enclosures and protective coverings. Indicate use of areas outside the work limits, including corridors, lobbies, elevators, loading areas and public thoroughfares. Indicate phasing of the work. Submit phasing plan as marked up bond prints.
- C. Obtain acceptance of Owner's property insurance carrier and roofing system warrantor (if any) for proposed work involving existing building prior to start of work.

1.4 QUALITY ASSURANCE:

- A. Pre-demolition conference: Prior to beginning demolition work, a pre-demolition conference will be held to review work to be accomplished and to inventory existing conditions.
 - 1. Contractor, Architect, Owner and related subcontractors involved in demolition work will be present.
 - 2. Contractor shall notify Architect and Owner at least seven days prior to time of conference.
 - 3. Demolition work and inventory of existing equipment, existing damages to work to remain and items to be removed shall be reviewed at conference.
 - 4. Contractor shall make list of inventoried items to be removed, reused or stored.
 - 5. Contractor shall take minutes of meeting and distribute minutes and copies of list to all participants.

- B. Mock-ups:
 - 1. Prior to beginning final work, perform a test for repair, refinishing and cleaning of each surface for Architect's review. If unacceptable to Architect, re-test methods and materials until approval is obtained. Perform test mock-ups in least conspicuous areas.
 - 2. Perform a test for Architect's review for each of the following finish surfaces:
 - a. Wood paneling.
 - b. Carpeting.
 - c. Resilient flooring and base.
 - d. Finish carpentry.
 - e. Wood doors.
 - f. Marble work.
 - g. Wall coverings.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Schedule use of loading areas with Owner.
- B. Store materials to be retained or reused in locations acceptable to Owner.
- C. Maintain neat, clean conditions in storage areas; remove rags and waste materials at end of each day's work.

1.6 PROJECT/SITE CONDITIONS:

- A. During demolition operations, should suspect asbestos or asbestos-containing materials, or other material listed as a hazardous material by the Environmental Protection Agency be discovered, notify Architect and Owner and discontinue that portion of the work until further instructed.
- B. Drawings indicating existing building conditions are available from Owner for general information only. Owner assumes no responsibility for the actual condition of structures to be demolished. Conditions existing at the time of inspection for bidding purposes will be maintained by Owner insofar as practicable. However, variations within the structure may occur by Owner's removal and salvage operations prior to the start of the demolition work.
- C. The use of explosives will not be permitted.
- D. Conduct demolition operations and the removal of debris to ensure minimum interference with roads, streets, walks and adjacent facilities.

- E. Do not close or obstruct streets or walks without permission from authorities having jurisdiction. Provide flagman where public thoroughfares are used for debris removal. Maintain thoroughfares free of dirt and debris caused by demolition or hauling operations.
- F. Conduct demolition operations to minimize disruption or interference with building occupants and operation, and the use of building facilities not included in the work. Coordinate phasing of work with Owner.
- G. Protect portions of existing building indicated to remain. Repair or replace portions of building damaged by this work, at no additional cost.
- H. Provide temporary enclosures or other methods to limit dust transmission to adjacent areas. Provide temporary weatherproof enclosures for portions of work exposed to weather. Provide temporary noise reduction barriers to separate work areas from adjacent occupied areas.
- I. Maintain building security. Equip doors with locks. Secure construction area during non-working hours.
- J. Where removal or alteration of concealed structural members is required, which are not included in detail on drawings, notify Architect and await instructions prior to proceeding.
- K. Provide temporary fire protection devices and construction when removing or relocating existing fire doors or barriers. Install permanent fire protective construction to close voids and penetrations as work progresses, as specified in Firestopping section. Coordinate with local building officials and Owner's insurance carrier.
- L. Provide temporary protective walkways or covering on existing finish floor surfaces to protect floor finishes. Provide plywood walkways on finish floors where machinery is moved or operated.
- M. Maintain or re-establish existing bench marks.
- N. Limit exterior dust by sprinkling or other acceptable methods.

PART 2 - PRODUCTS

2.1 PROTECTIVE COVERS:

- A. Partitions and dust protective coverings:
 - 1. Provide non-combustible panels, flame-resistant tarpaulins or approved materials of equivalent fire-retardant characteristics. Polyethylene sheet and other plastic films shall be reinforced, fire-resistive sheet, minimum 10 mil thickness, with a flame spread rating of 15 or less, meeting ASTM E84-15 and passing NFPA 701, Test Method 2.
 - 2. Provide equivalent fire-resistive tape for sealing joints.
- B. Protective covering for floors:
 - 1. Non-asphaltic, non-waxed, non-staining, reinforced kraft paper.
 - 2. Minimum 1/2" thickness plywood or composition board for walkways.
- C. Barricade and corner guard material:
 - 1. Utility grade lumber.
 - 2. Plywood.

2.2 REMOVED MATERIAL:

- A. The following items shall require possible removal, cleaning, restoration and reinstallation, or replacement, as required by demolition of flooring materials and job conditions:
 - 1. Entrance door thresholds and recessed floor closer devices.
 - 2. Kitchen equipment at STEM lab Building,
- B. Reuse of material: Reuse of any items involved in the work is subject to Contractor's ability to remove, store and reinstall the item without permanently damaging or marring the items to be reused. If Contractor is unable to reuse any item as prescribed herein, he shall substitute new material to match existing in lieu of reusing same. Contractor may also elect to use new material to match existing in lieu of reuse of existing for his own convenience.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Examination: Visit project site and compare locations of equipment, electrical and mechanical work with indications in Contract Documents. Report discrepancies discovered for resolution.
- B. Scheduling and phasing:
 - 1. Comply with approved execution plan for scheduling and phasing of the work.
 - 2. Coordinate disconnect or disruption of electrical and mechanical services with Owner.
- C. Establish level and line benchmarks on adjacent buildings prior to start of demolition work.
- D. Comply with governing regulations pertaining to environmental protection. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding and pollution.
- E. Erect and maintain temporary ditches, barriers, straw bale dams or skirts to prevent surface water from carrying debris beyond contract limits, onto adjacent properties or into storm drainage system.
- F. Plant protection:
 - 1. Cover, barricade or otherwise protect foliage of plants or trees designated to remain.
 - 2. Rinse dust from foliage and maintain plants watered during operations.
 - 3. Prevent spillage of demolition runoff or solutions of harmful liquids on root systems of plants or trees.
 - 4. Replace, at no cost to Owner, landscape items damaged by demolition operations.
- G. Clean adjacent structures and improvements of dust, dirt and debris caused by demolition operations, as directed by Architect or governing authorities. Return adjacent areas to condition existing prior to the start of the work.

3.2 DEMOLITION:

- A. Disconnect and seal off abandoned utilities and utilities to be removed prior to start of demolition. Utilities shall be disconnected below existing grade level or outside of contract limits by representatives of public utility being disconnected. Maintain utility service to facilities in use.
- B. Interior demolition:
 - 1. Remove interior construction and finishes as required for new construction and to limits indicated on drawings.
 - 2. Resilient floor coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.
- C. Remove existing mechanical and electrical equipment, including plumbing fixtures and piping, as indicated and required to complete work.
- D. Remove existing materials and finishes to limits indicated without damage to substrates or adjacent surfaces.
- E. Where work is to be cut or removed to accommodate new work, form neat, uniform and smooth edges or terminations.
- F. Proceed with demolition in accord with approved schedule.
 - 1. Demolish concrete and concrete unit masonry in small sections.
 - 2. Remove structural framing members and lower to ground by means of hoists, derricks or other suitable methods.
 - 3. Locate demolition equipment throughout the structure and remove materials so as not to impose excessive loads to supporting walls, floors or framing.
 - 4. Where new construction connects to existing, Contractor shall provide and maintain temporary partitioning until removal is directed by Architect. Contractor shall execute new construction to maximum extent possible before breakthrough to existing, and shall advise Owner in writing of the intended breakthrough and the demolition methods to be used. Contractor shall schedule the work to provide minimum shutdown of the operations of Owner.
- G. Provide all necessary shoring and bracing to maintain structural integrity of the building during demolition operations. Remove only after new structure is in place and capable of supporting braced or shored parts.
- H. During demolition, protect adjoining work from damage. Observe and monitor adjacent structural elements. Stop work and notify Architect for instructions if changes are noted. Cracks or structural damage resulting from demolition shall be repaired at no expense to Owner and to Architect's satisfaction.
- I. Prepare an itemized list of material or equipment for reuse or storage. List quantities, condition and location. Submit copies to Owner within seven days of removal of item.
- J. Except for items designated to be removed and reused in the work or items retained by Owner for storage, all material resulting from this work shall become property of Contractor and shall be promptly removed from site. Storage or sale of removed materials will not be permitted on project site or within building.

- K. Resilient floor coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.
- L. Materials resulting from demolition become the property of Contractor except as follows:
 - 1. Equipment belonging to utility or public service companies unless abandoned by such companies.
 - 2. Hidden valuable items, buried items and property of third persons.
 - 3. Salvaged equipment and materials noted for reuse.
 - 4. Other items indicated or otherwise identified by Owner or Architect.

3.3 DISPOSAL OF DEMOLISHED MATERIALS:

- A. Remove debris, rubbish and other materials resulting from demolition operations from the project site. Do not stockpile debris on project site.
- B. Removal of debris from interior demolition shall be through unoccupied spaces and corridors, with removal through occupied spaces or corridors only upon specific permission by Owner.
- C. Burning of removed materials from demolished structures will not be permitted on the project site.
- D. Transport materials removed from demolished structures and dispose of off project site.
- E. Chute and load debris and materials within confines of existing open spaces on project site. Chuting and loading in streets surrounding site is prohibited when such operations can be executed on project site. Immediately remove debris or materials that fall onto streets or walks surrounding site.

3.4 REPAIR WORK:

- A. Repair dents, cracks, scratches and holes in existing finishes to remain as part of the finished work.
- B. Repair wood doors, wood paneling, finish carpentry using putty, and stain matching color of existing work.
- C. Ceiling suspension system:
 - 1. Replace damaged ceiling components.

End of Section

SECTION 03 8215

CONCRETE CORING AND LEVELING

PART 1 - GENERAL

1.1 SUMMARY:

- A. Work of this section includes filling and transition tapering and feather edging of existing interior subfloor surfaces to provide substrates meeting requirements specified and suitable to receive finish floor materials.
- B. Related work:
 - 1. Cutting and patching.
 - 2. Selective demolition.
 - 3. Tiling.
 - 4. Resilient flooring.

1.2 SUBMITTALS:

- A. Shop drawings: Submit shop drawings indicating coring locations and sizes, subfloor elevations and degree of corrective work required for filling, leveling and transitioning. Make drawings on copies of floor plans taken from the drawings. Indicate spot elevations of existing substrates and relate, plus or minus, to required elevations for each floor. Indicate the maximum depth of the fill and transition material and type of proposed material.
- B. Product data: Submit manufacturer's printed product data for floor filling and transitioning compounds. Indicate methods of mixing and application for depths proposed for the work, and requirements for subsurface preparation.
- C. Certification: Submit certification of compatibility between filling and transitioning compounds and finish flooring materials to be adhered to floor surfaces.

1.3 QUALITY ASSURANCE:

- A. Applicable standards; standards of the following as referenced herein:
 - 1. ASTM International (ASTM).
 - 2. Factory Mutual (FM).
- B. Manufacturer's qualifications:
 - 1. Manufacturer of floor filling and transitioning compounds shall submit evidence of formulating and marketing such products for a period of not less than five years. Manufacturer shall submit similar evidence of satisfactory completion of work of similar scope using the products submitted for this project.
 - 2. Manufacturer shall provide technical personnel for on-site inspection and recommendations for material usage and surface preparation.
- C. Installer qualification: Installer shall be a firm regularly engaged in the filling and transitioning of existing concrete floor surfaces. Installer shall have not less than five years experience and shall submit evidence of satisfactory completion of work of similar scope. Installer shall be trained and approved by materials manufacturer.

1.4 DELIVERY, STORAGE AND HANDLING:

- A. Deliver materials in original unopened containers displaying product name, type, grade and mixing instructions.
- B. Store materials in dry, covered storage, off ground.
- C. Store flammable materials in dry, cool storage area, away from fire, flame or source of ignition.

1.5 PROJECT/SITE CONDITIONS:

- A. Comply with manufacturer's printed product data regarding environmental conditions for floor compounds.
- B. Protect adjacent materials from compounds. Remove displaced materials.

PART 2 - PRODUCTS

2.1 CEMENTITIOUS FILLING, LEVELING AND TRANSITIONING COMPOUND:

- A. Acceptable products:
 - 1. Ardex, Inc., Ardex K-15 Premium Self-Leveling Underlayment.
 - 2. Bonsal/ProSpec, Inc., ProSpec Level Set 300 Underlayment.
 - 3. Dayton Superior, LeveLayer Premium Self-Leveling Underlayment.
 - 4. Mapei Corp., Ultraplan 1 Plus.
- B. Characteristics:
 - 1. Type: High strength, fast-setting, non-shrink cementitious underlayment.
 - 2. Thickness: As indicated; from feather-edge to 1-1/2" without aggregate; to 5" with aggregate.
 - 3. Aggregate for fill over 1-1/2" thick: As recommended by fill material manufacturer.
 - 4. Compressive strength: Minimum 4100 psi at 28 days in accord with ASTM C109-13.
 - 5. Flexural strength: Minimum 1,000 psi at 28 days when tested in accord with ASTM C348-14.
 - 6. Flammability: Class A when tested in accord with ASTM E84-15.
 - 7. Primers and additives: As recommended by fill material manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Examination and verification:
 - 1. Examine existing interior subfloor surfaces for conditions affecting the work. Coordinate observation with requirements of finish floor materials specified as part of the work.
 - 2. Employ engineering instruments to determine levelness and irregularities of surfaces.
 - 3. Take spot elevations throughout each floor to determine overall levelness of floors.
 - 4. Take additional readings to accurately determine size, location and depth or height of area to receive corrective work.
 - 5. Relate readings to required elevations for each floor and record on shop drawings.

- B. Preparation:
 - 1. Prepare substrates to receive manufactured floor filling and transitioning compounds in accord with manufacturer's product data submitted to and approved by Architect.
 - 2. Clean substrates of adhesives, oil, grease, loose or foreign materials and substrates which would impair bond.
 - 3. Prior to installing any fill or transition materials, provide temporary dams to prevent liquid materials from migrating through floors or onto adjacent construction.
 - 4. Contractor shall cut or grind minor protrusions and offsets in the structural slab which will not adversely affect the structural performance of the slab. Proposed cutting or grinding areas shall be identified on layout plan and shall be approved prior to performing the work.
 - 5. Do not remove or grind existing floor finishes suspected containing asbestos. Notify Architect and Owner of conditions and do not proceed prior to receipt of further instructions.

3.2 FILLING AND TRANSITIONING:

- A. Prime floor surfaces to receive filling and transitioning compound as required by manufacturer's product data.
- B. Mix and apply filling and transitioning compounds in accord with manufacturer's product data. Perform filling to bring existing concrete floor substrate to tolerance of $\pm 1/8$ " in 10'-0", free of voids, holes and irregularities which would adversely affect finish flooring. Bring surfaces to elevations indicated on drawings.
- C. Install transition material to provide featheredge, extended tapers or slopes as indicated on drawings and elevations. Slopes and tapers shall be installed to tolerance of $\pm 1/8$ " in 10'-0" smoothness.
- D. Achieve finish elevations and tolerances indicated. Utilize compounds for full thicknesses of fills and transitions encountered. Provide screeds to achieve finished elevations.

3.3 FIELD TESTING:

- A. Take sample cubes of fill compound for testing during initial installation, in accord with manufacturer's instructions. Samples shall be tested for specified compressive strength in accord with ASTM C472-99(2014).

3.4 PROTECTION:

- A. Do not allow traffic in pour areas for a minimum of three days after application.
- B. Protect cured compound from heavy or wheeled loads during remainder of construction period with overlayment of wood planks or 1/2" thickness plywood. Keep installation clean until applications of floor finish materials.

End of Section

SECTION 04 0513

MASONRY MORTARING AND GROUTING

PART 1 - GENERAL

1.1 SUMMARY:

- A. Related work specified elsewhere:
 - 1. Cast-in-place concrete.
 - 2. Concrete unit masonry.
 - 3. Brick masonry.
 - 4. Cast stone masonry.
 - 5. Water repellents.
 - 6. Flexible flashing.
 - 7. Joint sealants.

1.2 SUBMITTALS:

- A. Product data: Submit manufacturer's product specifications, test data and mixing and installation instructions for each manufactured product.
- B. Mix design: Submit mix design, including properties, materials and proportions, for mortar.
- C. Samples: Submit actual mortar samples for colored mortar, 3/8" wide by 8" long, indicating color range of each color selected. Samples shall be made using cement brand and type, proportions and sand source proposed for work on this project.

1.3 QUALITY ASSURANCE:

- A. For each type and color of cement specified, only one brand shall be used throughout project.
- B. Standards of ASTM International (ASTM), as referenced herein.

1.4 DELIVERY, STORAGE AND HANDLING:

- A. Deliver materials, except aggregate, in original unopened containers displaying product name, type, grade and mixing instructions.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Portland cement: Meeting ASTM C150-12, Type I, maximum 0.6% alkali, natural color, domestic manufacture.
- B. Masonry cement: Meeting ASTM C91-12, non-staining, 22% maximum air content by volume and proportioned to comply with requirements of ASTM C270-14a for Type S mortar.
- C. Hydrated lime: Meeting ASTM C207-06(2011), Type S.

- D. Pre-mixed, colored masonry cement:
1. Acceptable products; pending compliance with specified characteristics and acceptable color range to match specified color:
 - a. Argos, Custom Color Masonry Cement.
 - b. Cemex S.A.B. de C.V.; Richcolor Masonry Cement.
 - c. Essroc, Italcementi Group; flamingo-BRIXMENT.
 - d. Holcim (US) Inc.; Holcim Mortamix Rainbow Custom Colored Masonry Cement.
 2. Characteristics: Meeting ASTM C91-12, Type S non-staining, 19% maximum air content by volume, with inert, alkali-resistant, fade-resistant mineral pigments and complete with water-reducing and plasticizing admixtures, proportioned to comply with requirements of ASTM C270-14a for Type S mortar with minimum 28-day compressive strength of 1800 psi.
 3. Colors: As selected by Architect from samples formulated for Type S mortar.
- E. Aggregate:
1. For mortar: Clean, hard, natural washed sand meeting ASTM C144-11. Provide aggregate from single source for colored mortar.
 2. For cement grout: Meeting ASTM C404-11, fine aggregate, Size #1 for fine grout; Size #8 for coarse grout when minimum horizontal dimension of grouting space exceeds 4".
- F. Water-reducing and plasticizing admixture; acceptable products:
1. Anti-Hydro Co., A-H AHCO W/R.
 2. Chem-Masters Corp., Hydrolox 400.
- G. Non-shrink grout:
1. Acceptable products:
 - a. Anti-Hydro, A-H Aexpandcrete S Hi-Flow.
 - b. BASF Building Products, Masterflow 713.
 - c. Dayton Superior, Burke Non-Ferrous, Non-Shrink Grout.
 - d. Lambert Corporation, Vibropruf #11.
 - e. Laticrete International, Inc., L&M Crystex.
 - f. U. S. Grout Corp., Five Star Grout.
 - g. Bonsal American, Inc., ProSpec F-77 Construction Grout.
 - h. W. R. Meadows, Inc., 588 Precision Grout.
 2. Characteristics: Flowable, non-metallic, controlled expansive type grout.
- H. Anchoring cement for railings:
1. Acceptable products:
 - a. BASF Building Products, MasterFlow 110 AN
 - b. Bonsal American, Inc., ProSpec High Strength Precision Grout.
 - c. U. S. Grout Corp., Five Star Grout.
 2. Characteristics: Quick-setting, self-leveling, pourable cement base; waterproof, non-shrinking hydraulic compound.
- I. Water: Clean, potable, free from deleterious amounts of alkalies, acids and organic materials.

2.2 PROPORTIONS:

- A. Type S (minimum 1800 psi 28-day compressive strength) job-mixed or bag-mixed mortar: Proportion materials by volume in accord with ASTM C270-14a, as follows:
1. One part masonry cement to 1/2 part Portland cement to aggregate proportioned at not less than 2-1/4 nor more than three times the volumes of cements used, or;

2. One part Portland cement and 1/4 to 1/2 part hydrated lime to aggregate proportioned at not less than 2-1/4 nor more than three times the combined volume of cement and lime used, or;
 3. This method is required for pre-mixed colored masonry cement. One part pre-mixed Type S masonry cement to aggregate proportioned not less than 2-1/4 nor more than three times the volume of masonry cement used, and as directed by masonry cement manufacturer's product data to produce Type S mortar.
- B. Non-shrink grout: Mix prepared non-shrink grout product with water as directed by manufacturer's product data to achieve a minimum compressive strength of 7000 psi at 28 days.
- C. Anchoring cement for railings: Mix prepared anchoring cement product with water as directed by manufacturer's product data for immediate use.
- D. Pointing mortar: One part masonry cement to one part Type S hydrated lime to four parts aggregate.

PART 3 - EXECUTION

3.1 MIXING:

- A. Mix mortar and cement grout in power-driven, drum type mixers. Operate mixer for 3 to 5 minutes for mortar and minimum of five minutes for grout after addition of all materials.
- B. For job-mixed mortars, add water-reducing and plasticizing admixture in accord with admixture manufacturer's product data.
- C. Addition of other admixtures, including chloride-based admixtures and antifreeze ingredients, will not be permitted.
- D. Measure materials for job-mixed mortars in a one cubic foot container. Do not measure by shovels.
- E. Discard grout not placed within 1-1/2 hours after water is added to mix, or sooner as indicated by grout manufacturer.

3.2 PLACING MORTAR AND GROUT:

- A. Place mortar as specified in Brick Masonry section, Concrete Unit Masonry section and Cast Stone Masonry section.
- B. Re-temper mortar as necessary to keep plastic. Do not use mortar after setting has begun or after 2-1/2 hours of initial mixing.
- C. Place anchoring cement and non-shrink grout as specified in other sections. Comply with manufacturer's product data.
- D. Where unit masonry walls are indicated to receive waterproofing, parge exterior surface of walls below ground level with not less than 3/8" of Portland cement mortar. Cove parging at footing.
- E. Mortar type requirements:
 1. Mortar for concrete unit masonry work shall be Type S.
 2. Mortar for brick masonry shall be Type S colored mortar.

3. Mortar for cast stone masonry shall be Type S colored mortar.

End of Section

SECTION 04 0523
MASONRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY:

- A. Related work specified elsewhere:
 - 1. Concrete.
 - 2. Masonry mortaring and grouting.
 - 3. Concrete unit masonry.
 - 4. Brick masonry.
 - 5. Joint sealants.

1.2 SUBMITTALS:

- A. Product data: Include manufacturer's product literature and installation instructions. Indicate fastener type and length for each installation condition. Indicate corrosion protection for each item including fasteners.
- B. Samples: Submit individual samples of reinforcement, accessories, fasteners and anchors.
- C. Shop drawings: Indicate bar bending details, bar lists and placement drawings for reinforcement.
- D. Mill tests:
 - 1. Submit for each heat of reinforcing steel, certifying mill tests conducted in accord with ASTM requirements.
 - 2. Costs for tests shall be borne by Contractor.
 - 3. Unidentified bundles may be rejected or tested at request of Architect. Cost of tests on unidentified bundles shall be borne by Contractor.
 - 4. Submit three copies of each test report to Architect.

1.3 QUALITY ASSURANCE:

- A. Applicable standards; standards of the following as referenced herein:
 - 1. American Concrete Institute (ACI).
 - 2. ASTM International (ASTM).
 - 3. Society for Protective Coatings (SSPC).
- B. Design criteria; masonry wall ties: Two-component tie design shall allow maximum clearance dimension between tie component and back-up plate of 0.05", and a maximum of 0.05" deformation in tie assembly when subjected to 100 lbs. load in either tension or compression, while allowing both vertical and horizontal movement in plane parallel to wall.

1.4 DELIVERY, STORAGE AND HANDLING:

- A. Deliver reinforcement and accessories in bundles or boxes with waterproof tags. Maintain tags attached until material is incorporated into work.
- B. Deliver and handle materials to prevent damage or weakening.
- C. Prevent accumulation of rust or debris on reinforcement accessories during storing. Store off ground and under cover.

PART 2 - PRODUCTS

2.1 MASONRY JOINT REINFORCEMENT:

- A. Acceptable manufacturers; subject to compliance with specified requirements:
 - 1. Heckmann Building Products, Inc.
 - 2. Hohmann & Barnard, Inc.
 - 3. Sandell Manufacturing Company, Inc.
 - 4. Wire-Bond.
- B. Masonry joint reinforcement:
 - 1. Material: Cold-drawn wire in accord with ASTM A1064-14.
 - 2. Types:
 - a. At single wythe masonry: Truss type.
 - b. At double wythe unreinforced masonry: Truss type with adjustable box ties, with box ties and cross wires spaced at 1'-4" o. c.
 - c. At double wythe reinforced masonry: Ladder type with adjustable box ties, with box ties and cross wires spaced at 1'-4" o. c.
 - 3. Longitudinal rods: Nine ga. deformed rods.
 - 4. Cross rods: Nine ga. rods, welded to longitudinal rods.
 - 5. Width of reinforcement shall be 2" less than total wall width.
 - 6. Provide reinforcement in minimum 10'-0" lengths with prefabricated corners and tees at intersecting walls of same design, and finish as joint reinforcement.
- C. Finishes:
 - 1. Joint reinforcement at interior construction: Mill galvanized, meeting ASTM A641-09a(2014) (0.10 oz. Zinc Coating/Ft²).
 - 2. Joint reinforcement, wire ties and anchors in exterior walls: Hot dip galvanized, complying with ASTM A153-09, Class B-2.

2.2 MASONRY VENEER ANCHOR SYSTEM FOR STUD BACKUP:

- A. Acceptable products; subject to compliance with specified characteristics:
 - 1. Heckmann Building Products, Inc., No. 315-D anchor plate with No. 316 V-shaped tie.
 - 2. Hohmann & Barnard Company, DW10-HS anchor plate with VBT Vee-Byna Tie V-shaped tie.
 - 3. Sandell Manufacturing Company, Inc., Sandell's Veneer Anchor and Veneer Triangle Tie.
 - 4. Wire-Bond, No. 1004 Type III anchor plate with V-shaped tie.
- B. Characteristics:
 - 1. Type: Two-component plate and tie assembly consisting of screw-attached back-up plate with handle-shaped projecting bar, encapsulating a wire vee tie.
 - 2. Anchor plates: Minimum 14 ga. steel flat plate punched to receive minimum two fasteners.
 - 3. Ties: V-shaped, minimum 3/16" diameter steel wire sized to extend within 1" of exposed veneer face.
 - 4. Finish: Hot dip galvanized in accord with ASTM A153-09, Class B-2.
- C. Fasteners: Self-tapping steel screws, corrosion-resistant coated; passing Kesternich test chamber, DIN 50018 standard with no indications of red rust or corrosion after minimum 30 wet and dry acidic atmosphere cycles and minimum 1000 hours salt spray testing in accord with ASTM B117-11.

2.3 PRESSURE RELIEVING PADS:

- A. Acceptable products; subject to compliance with specified requirements:
 - 1. Hohmann & Barnard, Inc., NS Closed Cell Neoprene Sponge..
 - 2. Sandell Manufacturing Company, Inc., Sandell's Closed Cell Neoprene.
 - 3. Wire-Bond, Horizontal/Vertical Expansion Joint.
- B. Type: Self-adhering, closed cell neoprene conforming to ASTM D1056-14, Class RE41, for compression up to 35%.
- C. Sizes:
 - 1. Horizontal joints: 2-3/4" depth by 1/4" width.
 - 2. Vertical joints: 3" depth by width matching joint width.

2.4 RUBBER CONTROL JOINTS:

- A. Acceptable products; subject to compliance with specified requirements:
 - 1. Hohmann & Barnard, Inc., RS Series, Rubber Control Joint.
 - 2. Wire-Bond, Control Joint 2900 Series.
- B. Type: Extruded rubber meeting ASTM D2000-12, Type 2AA, 805, minimum 80 durometer hardness.

2.5 MORTAR NET:

- A. Acceptable products; subject to compliance with specified requirements:
 - 1. Advanced Building Products, Inc., Mortar Break.
 - 2. Heckmann Building Products, Inc., Mortar Net.
 - 3. Hohmann & Barnard, Inc., Mortar Net.
 - 4. Mortar Net USA, Ltd., Mortar Net.
 - 5. Sandell Manufacturing Company, Inc., Sandell's Mortar Web.
 - 6. Wire-Bond, Mortar Net.
- B. Characteristics:
 - 1. Type: Mesh designed to catch and hold mortar droppings in an irregular pattern. Mesh shall not trap moisture or water. Mesh shall not support mold or fungus.
 - 2. Material: High density polyethylene or nylon strands woven into a 90% open mesh.
 - 3. Thickness: Match thickness of air space.

2.6 WIRE MESH HARDWARE CLOTH:

- A. Characteristics:
 - 1. Material: 1/2" by 16 ga. steel mesh.
 - 2. Size: 2" less than wall width by 1'-4" long minimum.
 - 3. Finish: Hot dip galvanized in accord with ASTM A153-09, Class B-2.

2.7 COLD GALVANIZING COMPOUND:

- A. Cold galvanizing compound: Pre-mixed, zinc dust and organic binders formulated specifically for use on steel surfaces. Compounds shall have concentrations of zinc dust in the range of 65% to 69% or above 92% in the dried film in accord with ASTM A780-09.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. General:
 - 1. Install reinforcement and accessories in accord with manufacturer's product data. Provide sizes and methods of attachment as required by installation conditions. In addition to installation spacings specified, provide specified reinforcement and accessories at perimeter of windows, doors and other openings.
 - 2. Where galvanized components must be field-welded to supports, remove galvanizing prior to welding.
 - 3. Limit misalignment of bed joints in one wythe to bed joint in second wythe of multi-wythe construction to 1-1/4".
- B. Install masonry joint reinforcement in masonry walls at 1'-4" o. c. vertically. Lap side rods 6" minimum at splices; greater as required by product data.
 - 1. Stop reinforcement 1" back from expansion and control joints and openings in masonry walls.
 - 2. Install reinforcement in first and second bed joint above and under openings, with noncontinuous reinforcement extending 2'-0" beyond jamb, each side.
 - 3. Install ladder type joint reinforcement with cross wires aligned with head joints of concrete masonry units.
 - 4. At splices, cross rods may be removed to facilitate placement.
- C. Attach masonry veneer anchor plates through sheathing to studs using specified fasteners.
 - 1. Install two fasteners per anchor plate assembly.
 - 2. Space anchor plates at 1'-4" o. c., each direction.
 - 3. Install one tie per plate, using specified fasteners.
- D. Install vertical and horizontal pressure relieving pads in masonry construction at locations indicated.
 - 1. Joint sizes shall match masonry joint widths.
 - 2. Keep joints clean of masonry droppings.
 - 3. Install pressure relieving pads with lengths butted.
 - 4. Install horizontal pressure relieving pads under shelf angles.
 - 5. Caulk joints using sealant as specified in Joint Sealants section. Joints shall be watertight and free from voids after caulking.
- E. Install rubber control joints as specified in Concrete Unit Masonry section. Location of control joints in masonry construction shall be as indicated on the drawings.
- F. Install mortar net in cavity walls in collar joint or cavity resting on flashing. Position with profiled side up.
- G. Install wire mesh hardware cloth at concrete masonry units to prevent migration of grout from masonry units, where units are indicated to be grouted.
- H. Repair of galvanized surfaces: After installation, clean surfaces from which galvanizing was removed during installation in accord with SSPC-SP 3, Power Tool Cleaning. Coat surfaces with cold galvanizing compound, 3.0 mils minimum dry film thickness.

SECTION 04 2113

BRICK MASONRY

PART 1 - GENERAL

1.1 SUMMARY:

- A. Related work specified elsewhere:
 - 1. Cold-formed metal framing.
 - 2. Rough carpentry.
 - 3. Concrete unit masonry.
 - 4. Cast stone masonry.
 - 5. Joint sealants.
- B. Work installed but furnished under other sections:
 - 1. Masonry mortaring and grouting.
 - 2. Masonry accessories.
 - 3. Steel lintels.
 - 4. Flexible flashing.
- C. Definition: Face brick: Exposed brick beginning two courses below finish grade.

1.2 SUBMITTALS:

- A. Product data: Submit manufacturer's product data, mixing and application procedures for masonry cleaning compound.
- B. Certificates: Indicate that materials supplied comply with specification requirements. Certificates shall be signed by brick manufacturer and shall state quantities and dates shipped.
- C. Samples: Submit five actual bricks indicating range of color, texture and size to be expected in finished work.

1.3 QUALITY ASSURANCE:

- A. Applicable standards; standards of the following, as referenced herein:
 - 1. ASTM International (ASTM).
 - 2. Southern Brick Institute (SBI) and Brick Institute of America (BIA).
- B. Sample wall panel:
 - 1. Lay 6'-0" long by 4'-0" high sample wall panel of face brick using mortar as specified in Masonry Mortaring and Grouting section and concrete unit masonry and cold-metal framing backup as specified in other sections. Orient panel as directed by Architect.
 - 2. Perform brick cleaning on completed sample panel, to ensure proposed masonry cleaning compound causes no staining nor discoloration of brick.
 - 3. Indicate the following:
 - a. Bonding.
 - b. Mortar color.
 - c. Joint tooling.
 - d. Brick color and texture.
 - e. Reinforcement.
 - f. Workmanship.
 - g. Cavity clearance.
 - h. Brick cleaning.

4. Prepare panel at least 14 days prior to beginning masonry work. Should panel be disapproved, prepare additional panels until approved by Architect.
5. Maintain panel throughout work as standard of masonry work. Do not destroy panel until directed by Architect. Undamaged, approved panel may remain as part of the complete work.

1.4 PROJECT/SITE CONDITIONS:

- A. Cold-weather construction: Implement cold weather construction provisions of ACI 530.1/ASCE 6/TMS 602, Article 1.8 C, or the following procedures, when either ambient temperature falls below 40°F or temperature of masonry units is below 40°F.
1. Preparation:
 - a. Provide temperatures of masonry units not less than 20°F when laid in masonry. Do not lay masonry units containing frozen moisture, visible ice or snow on their surface.
 - b. Remove visible ice and snow from top surface of existing foundations and masonry to receive new construction. Heat these surfaces to above freezing, using methods that do not result in damage.
 2. Construction: The following requirements shall apply to work in progress and shall be based on ambient temperature.
 - a. Meet the following construction requirements when ambient temperature is between 40°F and 32°F:
 - 1) Do not heat water and aggregates used in mortar and grout above 140°F.
 - 2) Heat mortar sand or mixing water to produce mortar temperatures between 40°F and 120°F at time of mixing. Heat water and aggregates for grout if they are below 32°F.
 - b. Meet requirements of Building Code and the following construction requirements when ambient temperature is between 32°F and 25°F:
 - 1) Maintain mortar temperature above freezing until used in masonry.
 - 2) Heat aggregates and mixing water for grout to produce grout temperature between 70°F and 120°F at time of mixing. Maintain grout temperature above 70°F at time of grout placement.
 - c. Meet requirements of Building Code and the following construction requirements when ambient temperature is between 25°F and 20°F:
 - 1) Heat masonry surfaces under construction to 40°F.
 - 2) Provide wind breaks or enclosures when the wind velocity exceeds 15 miles per hour (mph).
 - 3) Prior to grouting, heat masonry to a minimum of 40°F.
 - d. Meet requirements of Building Code and the following construction requirements when ambient temperature is below 20°F: Provide enclosures and auxiliary heat to maintain air temperature within enclosure to above 32°F.
 3. Protection: Requirements of this section and Building Code apply after masonry is placed and shall be based on anticipated minimum daily temperature for grouted masonry and anticipated mean daily temperature for ungrouted masonry.
 - a. When temperature is between 40°F and 25°F, cover newly constructed masonry with a weather-resistive membrane for 24 hours after being completed.

- b. When temperature is between 25°F and 20°F, cover newly constructed masonry with weather-resistive insulating blankets, or equal protection, for 24 hours after being completed. Extend time period to 48 hours for grouted masonry, unless the only cement in grout is Type III Portland cement.
 - c. When temperature is below 20°F, maintain newly constructed masonry at a temperature above 32°F for at least 24 hours after being completed by using heated enclosures, electric heating blankets, infrared lamps or other acceptable methods. Extend time period to 48 hours for grouted masonry, unless the only cement in grout is Type III Portland cement.
- B. Hot weather construction: Implement hot weather construction provisions of ACI 530.1/ASCE 6/TMS 602, Article 1.8 D, or the following procedures, when temperature or temperature and wind-velocity limits of this section are exceeded.
 1. Preparation: Meet the following requirements prior to conducting masonry work.
 - a. Temperature: When ambient temperature exceeds 100°F, or exceeds 90°F with a wind velocity greater than 8 mph (13 km/h):
 - 1) Provide necessary conditions and equipment to produce mortar having a temperature below 120°F.
 - 2) Maintain sand piles in a damp, loose condition.
 - b. Special Conditions: When ambient temperature exceeds 115°F, or 105°F with a wind velocity greater than 8 mph (13 km/h), implement requirements of Building Code, and shade materials and mixing equipment from direct sunlight.
 2. Construction: Meet the following requirements while masonry work is in progress.
 - a. Temperature: When ambient temperature exceeds 100°F, or exceeds 90°F with a wind velocity greater than 8 mph (13 km/h):
 - 1) Maintain temperature of mortar and grout below 120°F.
 - 2) Flush mixers, mortar transport containers and mortar boards with cool water before they come into contact with mortar ingredients or mortar.
 - 3) Maintain mortar consistency by retempering with cool water.
 - 4) Mortar shall be used within 2 hours of initial mixing.
 3. Special conditions: When ambient temperature exceeds 115°F, or exceeds 105°F with a wind velocity greater than 8 mph, implement requirements of Building Code using cool mixing water for mortar and grout. The use of ice is permitted in mixing water prior to use. Do not use ice in mixing water when added to other mortar or grout materials.
 4. Protection: When mean daily temperature exceeds 100°F, or exceeds 90°F with a wind velocity greater than 8 mph (13 km/h), fog-spray newly constructed masonry until damp at least three times a day until masonry is three days old.
- C. Protection of work:
 1. During erection, at end of each day or shutdown period, keep walls dry by covering with waterproof material, anchored and overhanging each side of wall at least 2'-0".
 2. Remove misplaced mortar or grout immediately.
 3. Protect face materials against staining.
 4. Protect sills, ledges and offsets from mortar droppings during construction.

- D. Sequencing and scheduling: Do not enclose or cover mechanical or electrical work requiring inspection until such work has been accepted. Coordinate this work with work of other sections required to be built into masonry construction.

PART 2 - PRODUCTS

2.1 FACE BRICK:

- A. Acceptable manufacturers:
1. Acme Brick co.
 2. Boral Bricks, Inc.
 3. Endicott Clay Products Co.
 4. Glen-Gery Corp.
 5. Hanson Brick & Tile.
 6. Interstate Brick.
 7. Taylor Clay Products, Inc.
 8. Tri-State Brick & Stone, Inc.
- B. Brick: Modular to match existing brick.
- C. Accent brick: As selected by Architect.
- D. Meeting ASTM C216-15, Grade SW, Type FBS.
- E. Color and texture:
1. Modular brick: Match existing buildings.
 2. Accent brick: As selected by Architect.
- F. Special shapes: Including, but not limited to, specially fabricated lip bricks, watertables, arches and solid units of same quality, color and texture as face brick.

2.2 ACCESSORIES:

- A. Weepholes:
1. Weephole ventilators for full head joint installation at grade level and at top of walls.
 - a. Acceptable products:
 - 1) Hohmann & Barnard, Inc., QV - Quadro-Vent.
 - 2) Sandell Manufacturing Company, Inc., Sandell's Standard Cell Vents.
 - 3) Wire-Bond, Cell Vent.
 - b. Characteristics: Flexible ultra-violet resistant polypropylene co-polymer vent with cellular structure. Color shall be as selected by Architect.
 2. Weep tubes with screens and wicks for all areas except grade level:
 - a. Acceptable products:
 - 1) AA Wire Products Co., #AA223KW;
 - 2) Hohmann & Barnard, Inc., #341.
 - 3) Sandell Manufacturing Company, Inc., Sandell's Plastic Weep Tubes.
 - b. Characteristics: 3/8" o.d. plastic tubes with brass screening at face and twisted synthetic rope wicks inserted in tube and extending minimum 6" at back (cavity) side.

- B. Masonry cleaning compound: Use compound as recommended by brick manufacturer and cleaning compound manufacturer for selected brick, to ensure proposed masonry cleaning compound causes no staining nor discoloration of brick.
1. Acceptable products:
 - a. Diedrich Technologies, Inc.,
 - 1) For dark colored brick and brick subject to non-metallic staining: 200 Lime Solv or 202 New Masonry Detergent.
 - 2) For light colored brick and brick subject to metallic staining: 202V Vana-Stop.
 - b. ProSoCo, Inc.,
 - 1) For dark colored brick and brick subject to non-metallic staining: 101 Lime Solvent or Sure Klean 600.
 - 2) For light colored brick and brick subject to metallic staining: Vana Trol.
 2. Type: Compound of organic and inorganic acids, wetting agents and inhibitors.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Workmanship: Install no cracked, broken or chipped units exceeding ASTM allowances.
1. Use abrasive power saws to cut brick. Avoid slivers less than one-third brick width.
 2. Lay brick plumb, true to line and with level courses, spaced within allowable tolerances.
 3. Do not furrow bed joints.
 4. Stop-off horizontal run by racking back in each course; toothing is not permitted.
 5. Adjust units to final position while mortar is soft and plastic.
 6. If units are displaced after mortar has stiffened, remove, clean joints and units of mortar, and relay with fresh mortar.
 7. Cutting and patching of finish masonry to accommodate work of other trades shall be done so as not to mar appearance of finished surface.
 8. Adjust shelf angles to keep work level and at proper elevation. Provide for a 3/8" joint below shelf angle.
 9. Mix units from pallets in work to diminish noticeable variation in color and texture between pallets.
 10. Provide brick expansion joints with pressure-relieving pads continuous under shelf angles.
 11. When joining fresh masonry to set or partially set masonry, remove loose brick and mortar, and clean and dampen exposed surface of set masonry prior to laying fresh masonry.
 12. Provide solid brick units free of cores or frogs where such characteristics would be exposed in the finished work.
 13. Wet brick with initial rate of absorption exceeding 30 grams/30 sq. in./min. when tested in accord with ASTM C67-14.
 14. Cavity walls: Keep cavity clear of mortar and other materials which project into cavity and decrease cavity clearance to less than minimum dimension indicated.
- B. Mortar beds:
1. Lay brick with full mortar coverage on horizontal and vertical joints in all courses.
 2. Provide sufficient mortar on ends of brick to fill head joints.

3. Rock closures into place with head joints thrown against two adjacent bricks in place.
 4. Do not pound corners or jambs to fit stretcher units after setting in place.
 5. Where adjustment to corners or jambs must be made after mortar has started to set, remove mortar and replace with fresh mortar.
- C. Mortar joints:
1. Nominal thickness: match existing thickness.
 2. Tool joints exposed in finished work when "thumbprint" hard. Joints shall be tooled using a jointer at least 2'-0" in length.
 3. Joint profile: Concave.
 4. Trowel point or concave tool joints below grade.
 5. Flush-cut joints not to be exposed in finished work.
 6. As work progresses, trowel protruding mortar fins in cavity flat to inner face of wythe.
- D. Bonding pattern: Lay brick in bonds indicated.
- E. Brick expansion joints: Install materials in accord with Masonry Accessories section. Joint size shall be same width as mortar joints.
1. Space pressure-relieving pads at expansion joints indicated on drawings.
 2. Coordinate location of expansion joints in brick work with control joints in unit masonry backup.
- F. Flashing:
1. Clean surface of masonry smooth and free from projections which might puncture flashing material.
 2. Place through-wall flashing on bed of mortar and cover with mortar as specified in Sheet Metal Flashing and Trim and Flexible Flashing section.
- G. Weepholes:
1. Provide weepholes in exterior wythe of masonry at 1'-4" o. c. horizontally at heads and sills of openings, in exterior walls at grade and in other locations where flashing is indicated.
 2. Weephole ventilators:
 - a. Provide weephole ventilators at grade level and at top of walls.
 - b. Install weephole ventilator in open head joint, flush with low edge of adjacent brick.
 3. Install weep tubes at all weep holes except at grade level and at top of walls where weephole ventilators are installed. Install weep tubes at bottom of head joint with screening to exterior; lay extra length of wick horizontally in cavity.
 4. Keep weep holes and area above flashing free of mortar droppings.
 5. Install cavity mortar drainage net at base of cavity behind weepholes. Install continuous at grade.
- H. Sealant joints: Retain 1/2" wide sealant joint around outside perimeter of exterior doors, window frames and other wall openings.
- I. Pointing: Cut out defective mortar joints and holes in exposed work. Repoint with new mortar.
- J. Dry cleaning: Brush brick surfaces with stiff bristle brush. Do not allow mortar droppings to harden on exposed surfaces.

3.2 SITE TOLERANCES:

- A. Acceptable tolerances:
 - 1. Maximum variation from plumb:
 - a. In lines and surfaces of walls and arrises:
 - 1) 1/4" in 10'-0".
 - 2) 3/8" in any story or 20'-0" maximum.
 - 3) 1/2" in 40'-0" or more.
 - b. For external corners, expansion joints and other conspicuous lines:
 - 1) 1/4" in any story or 20'-0" maximum.
 - 2) 3/8" in 40'-0" or more.
 - 2. Maximum variation from level or grades for exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines:
 - a. 1/4" in any bay or 20'-0".
 - b. 1/2" in 40'-0" or more.
 - 3. Maximum variation of linear building line from established position in plan and related portions of columns, walls and partitions:
 - a. 1/2" in any bay or 20'-0".
 - b. 3/4" in 40'-0" or more.
 - 4. Maximum variation in cross-sectional dimensions of columns and thickness of walls: Not less than 1/4" smaller nor more than 1/2" larger than indicated.

3.3 FINAL CLEANING:

- A. At least 21 days prior to application of specified cleaning solution to brick work, apply solution on half of the surface of sample panel. Should discoloration of brick or mortar joints, staining or efflorescence appear on sample panel, notify Architect and await further instructions.
- B. No wet cleaning shall take place within seven days of placing masonry.
- C. Apply masonry cleaning compound on brick masonry as tested on sample panel in accord with manufacturer's product data. Flush with clean water.
- D. At least two hours prior to application of cleaning solution to brick work, saturate mortar joints with clean water and flush off loose debris.
- E. Begin cleaning process at highest point of wall, working downward. Work in areas of 20 sq. ft., maximum. As cleaning progresses, flush wall to prevent accumulation of scum.
- F. Safely discard solutions containing debris and residue.
- G. Do not scrub mortar joints with cleaning solution.
- H. Protect materials adjacent to brick work which are subject to corrosion from contact with cleaning solution.
- I. Remove stains in accord with recommendations of the SBA/BIA, Technical Notes #20. Use cleaning agents only after pre-testing on sample panel.

End of Section

SECTION 04 2200
CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY:

- A. Work of this section includes standard concrete masonry units, and building in of work of other trades.
- B. Related work specified elsewhere:
 - 1. Concrete.
 - 2. Concrete reinforcing.
 - 3. Brick masonry.
 - 4. Elastomeric coatings.
 - 5. Dampproofing.
- C. Work installed but furnished under other sections:
 - 1. Masonry mortaring and grouting.
 - 2. Masonry accessories.
 - 3. Flexible flashing.
 - 4. Metal door frame wall anchors.

1.2 SUBMITTALS:

- A. Samples: Submit three samples for each type of exposed concrete masonry unit, indicating range of color and texture to be expected in finished work, if requested by Architect.
- B. Certificates:
 - 1. Submit certificates from masonry manufacturer prior to delivery of concrete masonry units to project site. Each certificate shall be signed by an authorized officer of the manufacturing company and shall contain the name and address of Contractor, the project location and the quantities and date or dates of shipment or delivery to which the certificate applies.
 - 2. Units shall be certified for compliance with specification requirements, including compressive strength, moisture content and linear drying shrinkage.
 - 3. Time-rated, fire-resistant masonry units shall be certified by manufacturer to comply with mix design and equivalent thickness requirements of Underwriters Laboratories, Inc., (UL) for time ratings indicated. Certification shall include evidence of manufacturer's qualification to manufacture fire-rated units.
- C. Test reports: Reports prepared by a qualified independent laboratory indicating compliance with the performance requirements specified herein.

1.3 QUALITY ASSURANCE:

- A. Applicable standards:
 - 1. Standards of ASTM International (ASTM), as referenced herein.
 - 2. Portland Cement Association (PCA), "Concrete Masonry Handbook".
- B. Manufacturer's qualification: Manufacturer of time-rated, fire-resistant masonry units shall be qualified in writing by Underwriters Laboratories, Inc., (UL) for manufacture of fire-rated units.

- C. Pre-installation meeting: At least two weeks before starting above-grade masonry work, schedule a pre-installation conference at the jobsite to discuss compliance with requirements of Contract Documents. Give two weeks advance notice to participants, including Contractor, mason contractor, flashing installer, and concrete unit masonry producer. Advise Architect of scheduled meeting date.
 - D. Sample wall panel:
 - 1. Construct a sample panel to determine compatibility of materials and effect of materials and construction procedures on final appearance of wall. Use jobsite materials, including specified water repellent concrete masonry units and mortar to construct sample panel.
 - 2. Lay 6'-0" long by 4'-0" high sample wall panel for concrete unit masonry in conjunction with face brick sample panel specified in Brick Masonry section.
 - 3. Indicate the following:
 - a. Bonding.
 - b. Range of mortar color.
 - c. Joint tooling.
 - d. Unit masonry range of color and texture.
 - e. Reinforcement.
 - f. Workmanship.
 - g. Cavity clearance.
 - h. Construction procedures to be performed on sample panel, including cleaning and application of specified coatings or sealants.
 - E. Prepare panel at least 14 days prior to beginning masonry work. Should panel not be acceptable to Architect, prepare additional panels until accepted by Architect. Acceptance of sample panel will not constitute approval of deviations from materials contained in sample panel, unless such deviations are approved by Architect in writing.
 - F. Maintain panel throughout work as standard for judging completed masonry work. Do not destroy panel until directed by Architect.
 - G. Erect separate panel for each type of masonry unit or mortar color required.
- 1.4 DELIVERY, STORAGE AND HANDLING:
- A. Keep units dry. Allow air circulation around stacked units. Wet concrete masonry units shall not be installed.
 - B. Protect units to be exposed in finish work from staining and physical damage of exposed faces.
 - C. Segregate pallets of various fire-rated units from each other and from other non-rated units; maintain clear indication of rating of stored units for easy identification and selection.
- 1.5 PROJECT/SITE CONDITIONS:
- A. Cold-weather construction: Implement cold weather construction provisions of ACI 530.1/ASCE 6/TMS 602, Article 1.8 C, or the following procedures, when either ambient temperature falls below 40°F or temperature of masonry units is below 40°F.

1. Preparation:
 - a. Provide temperatures of masonry units not less than 20°F when laid in masonry. Do not lay masonry units containing frozen moisture, visible ice or snow on their surface.
 - b. Remove visible ice and snow from top surface of existing foundations and masonry to receive new construction. Heat these surfaces to above freezing, using methods that do not result in damage.
2. Construction: The following requirements shall apply to work in progress and shall be based on ambient temperature.
 - a. Meet the following construction requirements when ambient temperature is between 40°F and 32°F:
 - 1) Do not heat water and aggregates used in mortar and grout above 140°F.
 - 2) Heat mortar sand or mixing water to produce mortar temperatures between 40°F and 120°F at time of mixing. Heat water and aggregates for grout if they are below 32°F.
 - b. Meet requirements of Building Code and the following construction requirements when ambient temperature is between 32°F and 25°F:
 - 1) Maintain mortar temperature above freezing until used in masonry.
 - 2) Heat aggregates and mixing water for grout to produce grout temperature between 70°F and 120°F at time of mixing. Maintain grout temperature above 70°F at time of grout placement.
 - c. Meet requirements of Building Code and the following construction requirements when ambient temperature is between 25°F and 20°F:
 - 1) Heat masonry surfaces under construction to 40°F.
 - 2) Provide wind breaks or enclosures when the wind velocity exceeds 15 miles per hour (mph).
 - 3) Prior to grouting, heat masonry to a minimum of 40°F.
 - d. Meet requirements of Building Code and the following construction requirements when ambient temperature is below 20°F: Provide enclosures and auxiliary heat to maintain air temperature within enclosure to above 32°F.
3. Protection: Requirements of this section and Building Code apply after masonry is placed and shall be based on anticipated minimum daily temperature for grouted masonry and anticipated mean daily temperature for ungrouted masonry.
 - a. When temperature is between 40°F and 25°F, cover newly constructed masonry with a weather-resistive membrane for 24 hours after being completed.
 - b. When temperature is between 25°F and 20°F, cover newly constructed masonry with weather-resistive insulating blankets, or equal protection, for 24 hours after being completed. Extend time period to 48 hours for grouted masonry, unless the only cement in grout is Type III Portland cement.
 - c. When temperature is below 20°F, maintain newly constructed masonry at a temperature above 32°F for at least 24 hours after being completed by using heated enclosures, electric heating blankets, infrared lamps or other acceptable methods. Extend time period to 48 hours for grouted masonry, unless the only cement in grout is Type III Portland cement.

- B. Hot weather construction: Implement hot weather construction provisions of ACI 530.1/ASCE 6/TMS 602, Article 1.8 D, or the following procedures, when temperature or temperature and wind-velocity limits of this section are exceeded.
1. Preparation: Meet the following requirements prior to conducting masonry work.
 - a. Temperature: When ambient temperature exceeds 100°F, or exceeds 90°F with a wind velocity greater than 8 mph (13 km/h):
 - 1) Provide necessary conditions and equipment to produce mortar having a temperature below 120°F.
 - 2) Maintain sand piles in a damp, loose condition.
 - b. Special conditions: When ambient temperature exceeds 115°F, or 105°F with a wind velocity greater than 8 mph (13 km/h), implement requirements of Building Code, and shade materials and mixing equipment from direct sunlight.
 2. Construction: Meet the following requirements while masonry work is in progress.
 - a. Temperature: When ambient temperature exceeds 100°F, or exceeds 90°F with a wind velocity greater than 8 mph (13 km/h):
 - 1) Maintain temperature of mortar and grout below 120°F.
 - 2) Flush mixers, mortar transport containers and mortar boards with cool water before they come into contact with mortar ingredients or mortar.
 - 3) Maintain mortar consistency by retempering with cool water.
 - 4) Mortar shall be used within 2 hours of initial mixing.
 - b. Special conditions: When ambient temperature exceeds 115°F, or exceeds 105°F with a wind velocity greater than 8 mph, implement requirements of Building Code using cool mixing water for mortar and grout. The use of ice is permitted in mixing water prior to use. Do not use ice in mixing water when added to other mortar or grout materials.
 - c. Protection: When mean daily temperature exceeds 100°F, or exceeds 90°F with a wind velocity greater than 8 mph (13 km/h), fog-spray newly constructed masonry until damp at least three times a day until masonry is three days old.
- C. Protection of work:
1. Keep walls dry during erection by covering at end of each work period with a waterproof membrane. Similarly protect partially completed walls not being worked on. Covering shall overhang at least 2'-0" on each side of wall and shall be anchored on each side of wall.
 2. Protect finished exposed work from stains.
 3. Mortar droppings sticking to unit faces shall be allowed to dry and then be removed with trowel, and surface lightly scrubbed with bristled brush.
 4. Particular care shall be given to keeping masonry units clean in areas not to be painted.
- D. Install and inspect mechanical and electrical work prior to enclosing or covering with masonry. Where runs of piping or conduit are required, cut away web of masonry unit without disturbing face or bond.
- E. Coordinate installation of masonry anchors with structural system to which masonry is attached.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS:

- A. Hollow load-bearing units:
 - 1. Meeting ASTM C90-14, lightweight.
 - 2. Nominal face dimensions: 8" by 1'-4".
 - 3. Depths: As indicated on drawings.
- B. Hollow non-load bearing units:
 - 1. Meeting ASTM C129-14a, lightweight.
 - 2. Nominal face dimensions: 8" by 1'-4".
 - 3. Depths: As indicated on drawings.
- C. Fire-rated units: Manufacture in accord with UL-618.
- D. Units shall be manufactured with lightweight aggregate meeting ASTM C331-14.
- E. Exposed external corners of interior concrete masonry units shall be square type.
- F. Masonry units for use in reinforced masonry construction shall be plain (square) end units.

2.2 ACCESSORY PRODUCTS:

- A. Masonry cleaning compound:
 - 1. Acceptable products:
 - a. Diedrich Technologies, Inc., 200 Lime Solv.
 - b. ProSoCo, H. D. Concrete Cleaner.
 - 2. Type: compound of inorganic and organic acids, wetting agents and inhibitors.

PART 3 - EXECUTION

3.1 WORKMANSHIP:

- A. Lay only dry masonry units.
- B. Lay masonry plumb, level and true to line with accurate coursing as indicated on drawings.
- C. Lay standard units in running bond with head joints centered in alternate courses.
- D. Cutting of masonry shall be done with abrasive power saw. Lay out units to minimize cutting.
- E. Cavity walls: Keep cavity clear of mortar and other materials which project into cavity and decrease cavity clearance to less than minimum dimension indicated. Provide mortar net in bottom of cavity and at flashing. Grout bottom of cavity solid as indicated on drawings.
- F. Composite walls: Fill cavity with mortar as work progresses.
- G. For modular substrate units, such as adjacent concrete masonry units, adjacent edges shall not exceed 1/32" difference in height.

- H. Site tolerances:
1. Maximum variation from plumb: 1/4" in 10'-0"; not exceeding 3/8" in 20'-0".
 2. Maximum variation from level: 1/4" in 20'-0"; not exceeding 1/2" in 40'-0" or more.
 3. Maximum variation in linear building line from location indicated: 1/2" in 20'-0".

3.2 BUILDING-IN OF OTHER WORK:

- A. Build in work of other trades indicated to be built-in with masonry, including anchors, wall plugs, expansion joints and accessories, as work progresses. Space and align built-in parts and exercise care not to displace other materials from position. Fill in spaces around built-in items with cement grout.
- B. Fill hollow metal frames in masonry walls with cement grout. Rake back 1/2" joint between hollow metal frame and adjacent masonry to receive sealant.
- C. Lay masonry to receive flashing with smooth joints without projections that could puncture flashing materials. Provide fresh mortar on both sides of flashing in masonry joints.
- D. Unless indicated otherwise, provide minimum 8" of solid end bearing full height of wall from floor to bearing points for lintels, beams and other load-supporting members by either solid block or filling cores with cement grout.
- E. Install accessory materials in accord with Masonry Accessories section.
1. Space pressure-relieving pads at control joints indicated on drawings.
- F. Provide lintels and bond beams where indicated using lintel blocks laid with joints matching adjacent work. Reinforcement shall be as indicated and block filled with concrete.
- G. No lintels are required for masonry openings of 3'-4" or less where support is provided by metal door frames and grouted with cement grout.

3.3 REINFORCED AND GROUTED UNIT MASONRY:

- A. Align vertical unit masonry cells to be filled to maintain unobstructed vertical cell, continuous to foundation, equal to the cell void of an individual masonry unit. Remove mortar droppings and debris from cells.
- B. Provide cleanouts at bottom of each vertical cell, at each pour of grout. Seal cleanouts after inspection of reinforcement, before grouting begins with concrete unit masonry face shell.
- C. Fabricate in accord with approved shop drawings.
- D. Provide dowels of same size as reinforcement at foundations at each vertical bar, as indicated on drawings.
- E. Install vertical reinforcing bar positioners at top of first course, at course below top of wall, and at a maximum space of 192 vertical bar diameters between top and bottom bar positioner.

- F. Install vertical reinforcement and horizontal bond beam reinforcement as indicated on drawings. Extend tops of vertical bars through openings made in bottom of bond beam units and bend horizontally into bond beam. Set anchor bolts and other devices indicated into bond beams prior to grouting.
 - 1. Placing tolerance for detailed position of vertical wall reinforcement: $\pm 1/2"$.
 - 2. Minimum distance between masonry unit faces and reinforcing bars:
 - a. Fine grout: $1/4"$.
 - b. Coarse grout: $1/2"$.
- G. Lap vertical bars not less than 2'-0". Extend bars into bond beams and foundation as indicated on drawings.
- H. Stop horizontal bond beam reinforcement 3" back from both sides of expansion and control joints.
- I. At specified reinforced cells, bond beams and open cells indicated to receive grout, fill solid with specified grout.
- J. Wet masonry prior to placement of grout. Wet no masonry until mortar has set and wetting will not damage mortar or mortar bond.
- K. Consolidate grout by working reinforcement bars and by rodding non-reinforced cells.
- L. Grout masonry in maximum 5'-0" high lifts. Form horizontal construction joints between lifts by stopping pour not less than 1-1/2" below top of uppermost course in lift. Form horizontal construction joint between lifts at courses to receive through-wall flashing.
- M. Provide not less than 8" of solid grouted end bearing, full height of wall, for lintels, beams, and other load-supporting members bearing on unit masonry walls.
- N. Prevent grout seepage or spillage onto exposed masonry unit faces.

3.4 MORTAR JOINTS:

- A. Bed joints for unreinforced partitions:
 - 1. Lay first course in full bed of mortar.
 - 2. On all other bed joints, apply mortar on face shell only of masonry unit already laid.
 - 3. On masonry unit to be laid, apply a beveled buttering to face shell to ensure full head joints.
- B. Bed joints for reinforced and fire-rated partitions:
 - 1. Lay courses in full bed of mortar.
 - 2. Head joints: Apply mortar to vertical face shells on both the masonry unit already laid and the unit to be laid to ensure full head joint.
- C. Place masonry unit by rolling it to a vertical position and shoving it against adjacent unit, achieving position and alignment with minimum of adjusting.
- D. Adjustment shall be made only while mortar is still soft and plastic by tapping to plumb and bringing to alignment. Remove unit and relay in fresh mortar when unit must be pulled back to align.

- E. Check each unit as laid with mason's level for level and for plumb with wall below.
- F. Where adjustment must be made after mortar has started to set, remove and replace mortar with fresh mortar.
- G. Keep bed and head joints uniform in width, except for minor variations required to maintain bond and locate returns. Standard thickness for both horizontal and vertical mortar joints shall be 3/8".
- H. Cut units to align vertical joints at corners and interlocking intersections of 6" walls. Units of less than half length will not be permitted. Butt intersecting 6" walls using horizontal preformed "T" reinforcement in alternate courses.
- I. Sealant joints: Retain 1/2" wide sealant joint around outside perimeter of exterior doors, window frames and other wall openings.

3.5 CONCRETE UNIT MASONRY CONTROL JOINTS:

- A. Make joint 3/8" wide, unless otherwise indicated. Align joints in concrete unit masonry backup with brick expansion joints.
- B. Stop horizontal joint reinforcement 1" from control joint.
- C. Provide joints in accord with PCA Handbook, as follows:
 - 1. In running walls spaced maximum 20'-0" o. c.
 - 2. At corners, joint located one header or stretcher unit from corner
 - 3. At intersecting walls, either of which is more than 10'-0" long.
 - 4. Above joints in foundations and floors and below joints in roofs and floors that bear on masonry walls.
 - 5. At abrupt changes in wall height.
 - 6. At changes in wall thickness, such as those at pipe or duct chases and those adjacent to columns or pilasters.
 - 7. At a distance of not over one-half of the allowable joint spacing from bonded intersections or corners.
 - 8. At door and window openings unless other crack control measures are used, such as joint reinforcement or bond beams.
 - a. At one side of openings less than 6'-0" wide.
 - b. At both sides of openings greater than 6'-0" wide.
- D. Where control joints occur in running walls, provide sash block with rubber control joint filler.
- E. Leave joint open and clean for caulking in accord with Joint Sealants section. Caulk joints exterior and interior.

3.6 JOINT TREATMENT:

- A. Flush joints: Strike joints flush in masonry to receive finish work of trades other than painting.
- B. Tooled joints:
 - 1. Strike exposed joints flush in standard masonry units and, when partially set, tool using V-shaped or concave tool.
 - 2. Tool mortar joints when they are thumbprint hard to provide greatest resistance to water-penetration and to help minimize hairline cracks between mortar and concrete masonry units.

- C. Point mortar joints. Remove and replace units with excessive spalls or chips.

3.7 CLEANING:

- A. Keep masonry work free of mortar droppings as work progresses. At completion of work, rub masonry to remove excess mortar.
- B. Architectural masonry sample panel cleaning: At least 21 days prior to application of cleaning solution to architectural masonry units, apply cleaning solution to half the surface of sample panel. Should discoloration of masonry or mortar joints, staining or efflorescence appear on sample panel, notify Architect and await further instructions.
- C. Clean exposed masonry using specified cleaning compound as follows:
 1. No wet cleaning shall take place within seven days of placing masonry.
 2. At least two hours prior to application of cleaning solution to masonry work, saturate mortar joints with clean water and flush off loose debris.
 3. Begin cleaning process at highest point of wall, working downward. Work in areas of 20 sq. ft., maximum. As cleaning progresses, flush wall to prevent accumulation of scum.
 4. Safely discard solution containing debris and residue.
 5. Do not scrub mortar joints with cleaning solution.
 6. Protect materials adjacent to masonry work which are subject to corrosion from contact with acid solution.

3.8 MASONRY WASTE DISPOSAL:

- A. Salvageable materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Masonry waste recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- C. Excess masonry waste: Remove excess clean masonry waste and other masonry waste, and legally dispose of off Owner's property.

End of Section

SECTION 04 7200
CAST STONE MASONRY

PART 1 - GENERAL

1.1 SUMMARY:

- A. Work of this section includes manufacture, transport, erection and cleaning of wet cast cast stone masonry.
- B. Related work specified elsewhere:
 - 1. Joint sealants.
 - 2. Concrete.
 - 3. Brick masonry.
 - 4. Masonry mortaring and grouting.
- C. Definitions:
 - 1. Cast stone: A precast architectural concrete building unit intended to simulate natural cut stone.
 - 2. Wet casting method: Manufactured from measurable slump concrete and vibrated into a mold until it becomes densely consolidated.

1.2 SUBMITTALS:

- A. Concrete mix design: Include items relative to design. Indicate deviations from Contract Documents and reason for proposed deviation.
 - 1. Aggregate source, type, supply capacity, uniformity of color and characteristics.
 - 2. Aggregate grading type (uniform or gap).
 - 3. Cement source, type, supply capacity, uniformity of color and characteristics.
 - 4. Cement content of mix.
 - 5. Water-cement ratio.
 - 6. Admixtures: Type, source and amounts.
 - 7. Compressive strength at form removal, seven days and 28 days.
 - 8. Air dry unit weight.
- B. Samples:
 - 1. Anchorages: Inserts and items for temporary anchorage and permanent connections to structure.
 - 2. Units: 2'-0" square. Indicate color and texture of finished work. Sample will be retained by Architect as standard for finished work.
- C. Shop drawings and sequence of erection drawings:
 - 1. Indicate sizes, sections and dimensions of units; arrangement of joints; joint sealant detail; reinforcement design; fabrication, and installation and erection details; and setting marks. Include location of openings, inserts, fasteners and other accessories to be cast into or fabricated in units.
 - 2. Identify cast stone units with mark used on shop drawings. Identifying marks shall be visible on non-exposed surfaces.
 - 3. Indicate approximate weight of unit.
- D. Test reports:
 - 1. Submit results of specified testing to Architect.
 - 2. Submit manufacturers test results of cast stone previously made by the manufacturer.

1.3 QUALITY ASSURANCE:

- A. Testing:
1. Testing as described below shall be performed as a part of the work in this section. Testing may be performed by cast stone manufacturer, subject to Architect's approval of manufacturer's testing facilities.
 2. Mix design: Submit mix design to Architect for acceptance prior to production of units.
 3. Production testing: During cast stone unit production, make a set of four 6" by 1'-0" compressive strength test cylinders for each 15 cubic yards of concrete placed.
 - a. Cast and cure cylinders using same methods as for cast stone units.
 - b. Perform compressive strength tests for one cylinder at seven days and two at 28 days. If 28-day tests indicate specified strength, discard remaining cylinder. Perform compressive strength testing in accord with ASTM C31-12, ASTM C39-14a and ASTM C642-12.
 - c. Furnish copies of tests, in duplicate, to Architect prior to shipping units. Tests shall be identified by unit designations.
 - d. Units not meeting design characteristics shall be rejected.
- B. Manufacturer Qualifications:
1. Manufacturer shall have sufficient plant facilities to produce the shapes, quantities and size of Cast Stone required in accordance with the project schedule.
 2. Manufacturer shall submit a written list of projects similar in scope and at least three (3) years of age, along with owner, architect and contractor references.
- C. Applicable standards; standards of the following, as referenced herein:
1. Cast Stone Institute: Comply with the requirements of the Cast Stone Institute Technical Manual.
 2. American Iron and Steel Institute (AISI).
 3. ASTM International (ASTM).
- D. Sample wall panel: Provide cast stone units of each type for building into sample panel as specified in Brick Masonry section.

1.4 DELIVERY, STORAGE AND HANDLING:

- A. Delivery and handling:
1. Transport and handle cast stone units with equipment to protect from strain, warping, cracking, chipping or staining.
 2. Do not place units in contact with earth.
 3. Place nonstaining resilient spacers of even thickness between units.
 4. Support units during shipment on expanded polystyrene or similar nonstaining, shock-absorbing material.
- B. Storage:
1. Store units to protect from strain, warping, cracking, chipping or staining.
 2. Store units in same position as transported with nonstaining resilient supports located in same positions as when transported.
 3. Store units on firm, level and smooth surfaces.
 4. Place stored units so that identification marks are discernible.
 5. Damaged units shall be rejected.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Portland cement: Meeting ASTM C150-12, Type IA or IIIA, white color. Use only one brand of cement for all cast stone units.
- B. Aggregate: Meeting ASTM C33-13, fine and coarse aggregate.
- C. Water: Clean, potable, free of alkali, acid, oil or organic matter.
- D. Reinforcement:
 - 1. Mesh: Meeting ASTM A1064-14 (replaces A185-07), electro-galvanized.
 - 2. Bars: Meeting ASTM A615-14, Grade 40 or Grade 60 as required for handling and in place design. Bars shall be hot dip galvanized.
- E. Anchors:
 - 1. Dowels, wedge anchors and similar shapes: AISI Type 302/304 stainless steel.
 - 2. Wire stirrups and anchors: Stainless steel wire, gauges as required by use.
- F. Setting mortar: As specified in Masonry Mortaring and Grouting section, Type S.
- G. Pointing mortar: One part Portland cement meeting ASTM C150-12, to one part hydrated lime meeting ASTM C207-06(2011), to six parts masonry sand meeting ASTM C144-11.
- H. Sealant: Silicone sealant as specified in Joint Sealants section.
- I. Color additive: Inert, pure mineral color additives meeting ASTM C979-10 except that carbon black pigments shall not be used.

2.2 UNIT CHARACTERISTICS:

- A. Characteristics: Meet the requirements of ASTM C1364-10b.
 - 1. Compressive strength: 6,500 psi when tested at 28 days in accord with ASTM C1194-03(2011).
 - 2. Water absorption: 6% maximum by the cold water method, or 10% maximum by the boiling method for products at 28 days, when tested in accord with ASTM C1195-03(2011).
 - 3. Air content: 4-8% for units exposed to freeze-thaw environments, when tested in accord with ASTM C173-14 or ASTM C231-14.
 - 4. Slump: 2" to 4" slump at time of placement, in accord with ASTM C143-12. Do not use zero-slump concrete.
 - 5. Type: Normal weight, 135-160 lbs./cu. ft.
 - 6. Color: Integral limestone color matching approved samples.
- B. Unit types and configurations: As indicated on drawings.
- C. Finish:
 - 1. Unexposed surfaces: Wood float finish, true to plane within specified tolerances.

2. Exposed surfaces: Match approved sample submittal.
 - a. Exposed to view surfaces shall have a fine-grained texture similar to natural stone, with no air voids in excess of 1/32". Density of such voids shall be less than three occurrences per any square inch, and shall not be discernible under direct daylight illumination at a distance of 5'-0".
 - b. Units shall exhibit a texture equal to approved sample when viewed under direct daylight illumination at a distance of 10'-0".
3. Color variation: Permissible variation in color between units of comparable age subjected to similar weathering exposure shall not exceed the following when tested in accord with ASTM D2244-15.
 - a. Total color difference: Not greater than 6 units.
 - b. Total hue difference: Not greater than 2 units.
4. Minor shipping/handling chipping: Reject units which exhibit shipping/handling chipping that is discernible from a distance of 20'-0" under direct daylight illumination.
5. Reject units which exhibit crazing or efflorescence.
6. Remove cement film from exposed surfaces prior to packaging for shipment.

2.3 FABRICATION:

- A. Fabricate cast stone units to sizes and profiles indicated. Provide connections at locations indicated.
- B. Design of reinforcement and anchorage, including reinforcement and inserts to withstand loads and stresses due to lifting, transporting and placing shall be the responsibility of cast stone manufacturer.
- C. Provide anchors and similar cast-in items at locations indicated on approved shop drawings.
- D. Form, place and consolidate concrete in accord with manufacturer's standard practices. Form cure units until sufficient strength has developed to permit handling units without damage. Moist cure exposed concrete surfaces.
- E. Provide holes and sinkages cut or drilled for anchors, fasteners, supports and lifting devices as necessary to secure work in place.
- F. In stones over 2'-0" in length, provide a 3/8" wide by 1" high notch through base of stone for drainage. Space notch(es) not to exceed 1'-4" o.c.
- G. Identify each unit with markings as indicated on setting drawings.
- H. Patch defects in exposed cast stone faces to match surrounding concrete. Discard units if patching does not produce uniform color and texture as specified herein.
- I. Manufacturing tolerances:
 1. Cross section dimensions shall not deviate by more than $\pm 1/8$ " from approved dimensions.
 2. Length of units shall not deviate by more than length/ 360 or $\pm 1/8$ ", whichever is greater, not to exceed $\pm 1/4$ ".
 3. Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed to by manufacturer.
 4. Warp, bow or twist of units shall not exceed length/ 360 or $\pm 1/8$ ", whichever is greater.

5. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features – On formed sides of unit, 1/8" (3 mm), on unformed sides of unit, 3/8" (9 mm) maximum deviation.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Install cast stone masonry in accord with approved shop and setting drawings, plumb, level and true to line within specified tolerances. Install no units which have been broken, stained or otherwise damaged during transit, storage or handling.
- B. Set cast stone coping units with a minimum of two threaded anchor bolts per unit. Align bolts to keep units within specified erection tolerances. Set units in full mortar bed securing bolts to top of parapet wall and coping.
- C. Set cast stone to be built into masonry as masonry work progresses. Anchor in accord with approved shop drawings.
- D. Conceal connections and fastening devices to be unexposed in finish work.
- E. Wet the cast stone units to be mortar set; set while wet.
- F. Size of vertical and horizontal joints shall be as follows:
 1. At stone/brick joints 3/8".
 2. At stone/stone joints in vertical position 1/4".
 3. Stone/stone joints exposed on top 3/8".
- G. Weepholes: Provide open head joints of at least 1" in height, spaced at maximum 24" o.c. If rope wicks are used, weep holes shall be placed at 16" o.c.
- H. Pointed joints at masonry-bound trim units:
 1. Fill joints with mortar as specified in Brick Masonry section.
 2. Rake joints at face to 3/4" depth.
 3. Point joints with pointing mortar after cleaning.
 4. Tool joints using a jointer at least 2'-0" in length.
 5. Joint profile: Concave.
- I. Sealant joints at coping stones and joints at column covers, cornices, platforms, soffits, window sills and stone sections with projecting profiles, exposed top joints or rigid suspension connections to supporting structure:
 1. Fill joints with mortar, as specified in Brick Masonry section, except head joints. Do not fill head joints.
 2. Rake mortar filled joints at face to 3/4" depth.
 3. Install backer rod and silicone sealant in joints, as specified in Joint Sealants section.
- J. Chip repair: Chips as a result of handling and installation, which are discernible when viewed under direct daylight illumination at a distance of 20'-0", shall be repaired with materials furnished by manufacturer. Texture and color of repaired chips shall not be discernible when viewed under direct daylight illumination at a distance of 10'-0".
- K. Site tolerances:
 1. Width of joint: +1/16", -1/8".

2. Alignment with face brick or building face: 1/8" or less with top masonry course.
3. Alignment of adjacent units: 1/8" in exposed faces.

3.2 CLEANING AND PROTECTION:

- A. Keep cast stone units free from misplaced mortar, grout and sealant during installation. Remove misplaced materials immediately to prevent staining.
- B. Prior to pointing, at completion of work, and at time of cleaning of brick masonry, clean cast stone using a detergent and water solution and stiff bristled brush. Flush clean. Use no acids or other cleaning compounds on cast stone without Architect's prior written approval.

End of Section

SECTION 05 5000
METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUBMITTALS:

- A. Shop drawings: Indicate sizes, shapes, fabrication and installation details for metal fabrications. Indicate anchorage to adjacent surfaces. Indicate shop finish. Where shop primer is required, indicate exact product used.
- B. Product data: Submit for manufactured items. Indicate materials, construction, finishes and installation instructions.
- C. Welder certification: Submit welders' qualifications in accord with AWS D1.1 and AWS D1.2, current within the previous 6 months, for Architect's information only.
- D. Research/evaluation reports: For post-installed anchors, from ICC-ES.

1.2 QUALITY ASSURANCE:

- A. Applicable standards:
 - 1. American Institute of Steel Construction (AISC), "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings".
 - 2. American Iron and Steel Institute (AISI), standards as referenced herein.
 - 3. American Welding Society (AWS):
 - a. AWS D1.1, "Structural Welding Code -- Steel."
 - b. AWS D1.2, "Structural Welding Code -- Aluminum."
 - c. AWS B2.1, "Welding Procedure and Performance Qualification."
 - 4. ASTM International (ASTM), standards as referenced herein.
 - 5. Society for Protective Coatings (SSPC), standards as referenced herein.
- B. Qualifications of welders:
 - 1. Welders employed on the work shall have passed qualification tests and shall be current within the past 6 months in the position for which employed, in accord with AWS D1.1 procedures.
 - 2. Contractor shall require any welder to retake the qualification test when, in Architect's opinion, welder's work creates a reasonable doubt as to the welder's proficiency. Requalification tests shall be conducted at no additional expense to Owner. Recertification shall be made to Architect after welder has passed the retest.
- C. Field measurements: Take field measurements prior to preparation of shop drawings and fabrication, to ensure fitting of work.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS:

- A. Materials shall be free from defects impairing strength, durability or appearance. Exposed surfaces throughout project shall have the same inherent texture and color for like locations.

- B. Fasteners: Fasteners and anchors shall be non-corrosive, non-staining and concealed, except as indicated on approved shop drawings. Exposed fasteners shall be of same materials, color and finish as material to which applied, shall be countersunk and finished flush.

2.2 BASIC MATERIALS:

- A. Structural steel shapes: Meeting ASTM A36-14.
- B. Hot-rolled carbon steel sheets and strips: Meeting ASTM A568-14 and ASTM A1011-14; Grade 40, minimum.
- C. Cold-rolled carbon steel sheets: Meeting ASTM A1008-13, Grade 40, Type 2, minimum.
- D. Structural steel plate: Meeting ASTM A36-14, 3/16" thickness.
- E. Other steel: Mild steel.

2.3 PRIMER PAINTS AND COATINGS:

- A. Primer paint for surfaces to receive finish painting: Compatible with required finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Painting and Coating section.
- B. Primer paint for components which do not receive further finish and components to be embedded into concrete: Organic zinc-rich primer meeting SSPC-Paint 20, Type II.
- C. Bituminous paint: Cold-applied asphalt emulsion complying with ASTM D1187-97(2011).
- D. Cold galvanizing compound: Pre-mixed, zinc dust and organic binders formulated specifically for use on steel surfaces. Compounds shall have concentrations of zinc dust in the range of 65% to 69% or above 92% in the dried film in accord with ASTM A780-09.

2.4 MISCELLANEOUS CONSTRUCTION:

- A. Provide items indicated or required to complete the work, including but not limited to the following:
 - 1. Lintels and shelf angles:
 - a. Exterior: Hot dip galvanized steel.
 - b. Interior: Mild steel.
 - 2. Anchors:
 - a. Exterior: Hot dip galvanized steel.
 - b. Interior: Mild steel.
 - 3. Hanger rods not provided by other trades: In size and length indicated or required; threaded full length or at ends.
 - 4. Counter support brackets, welded construction.
- B. Finish on miscellaneous items: Prime paint, unless otherwise specified.

2.5 FABRICATION:

- A. Form work true to line and level with accurate angles and surfaces and straight, sharp edges. Ease exposed edges to radius of approximately 1/32". Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- B. Weld corners and seams continuous and in accord with AWS specifications. Grind exposed welds smooth and flush, to match and blend with adjoining surfaces and without weakening base metal. Remove slag from welds before applying shop primer.
- C. Formed components: Molded, bent or shaped members shall be formed with clean, sharp arrises, without dents, scratches, cracks and other defects.
- D. Provide anchorage of type shown on approved shop drawings, coordinated with supporting structure.
- E. Fabrication tolerances: Machine fabricated and shop assembled mechanical joints shall fit within $\pm 1/32"$. Sizes of each element of an assembly shall be correct within 1/8"; total size of a freestanding assembly shall be correct within 1/2".

2.6 PROTECTIVE COATINGS:

- A. Shop primer: Ferrous metal, except galvanized surfaces, shall be cleaned and given one shop coat of shop primer as specified herein:
 - 1. Surface preparation: Clean surfaces after fabrication and immediately prior to shop painting in accord with SSPC-SP 3, Power Tool Cleaning or SSPC-SP 6/NACE No. 3, Commercial Blast Cleaning.
 - 2. Shop priming:
 - a. Shop prime steel components.
 - b. Shop prime surfaces after completion of fabrication.
 - c. Apply specified shop primer in accord with manufacturer's product data and SSPC Painting Systems Specifications to provide a dry film thickness of 2.5 mils.
 - d. Coat fabrications and anchors to be built into masonry construction using bituminous paint, 15 mils dry film thickness.
 - e. Apply shop primer within four hours after cleaning and before rust-bloom occurs. Paint only in relative humidity below 85 percent and surface temperatures of five degrees F. above dew point.
 - f. Where galvanized or zinc-coated metal is specified, metal shall not be shop primed.
- B. Galvanizing:
 - 1. Hot dip galvanizing applied to products fabricated from rolled, pressed and forged steel shapes, plates, bars and strips or zinc coatings on assembled steel products shall comply with ASTM A123-13, Grade 65.
 - 2. Hot dip galvanizing applied to products fabricated from steel sheet shall comply with ASTM A653-13, coating Designation G90.
 - 3. Hot dip galvanizing shall be done after fabrication.
 - 4. Preparation: Prior to galvanizing, remove dirt, scale, rust, oil, grease and similar debris, including residue resulting from welding and fabrication, by pickling or blasting. Clean, flux and dry materials prior to galvanizing.
 - 5. Following galvanizing, remove roughness, dross, blisters, lumps and runs. Immediately coat bare steel with cold galvanizing compound.
 - 6. Following galvanizing, surfaces to be painted shall be chemically treated for bond in accord with ASTM D6386-10.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Inserts and anchorages: Furnish inserts and anchoring devices which must be set in concrete for installation of work.
- B. Coordination: Coordinate setting drawings, diagrams, templates, instructions and directions for installation of anchorages, such as concrete inserts, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete construction.
- C. Shop assembly: Preassemble items in shop to greatest extent practicable to minimize assembly at project site. Disassemble units only to extent necessary for shipping and handling limitations. Mark units for reassembly.
- D. Where galvanized components must be field welded to supports, remove galvanizing prior to welding.

3.2 INSTALLATION:

- A. Fastening to in-place construction: Provide anchorage devices and fasteners to secure to in-place construction; including threaded fasteners for concrete inserts, toggle bolts and through-bolts.
- B. Cutting, fitting and placement: Perform cutting, drilling and fitting to install work. Set work in location, alignment and elevation, plumb and level, true and free of rack, measured from established lines and levels. Install work in accord with approved shop drawings.
- C. Fitting: Fit exposed connections to form hairline joints. Field weld connections which cannot be shop welded. Grind joints smooth.
- D. Field painting: For surfaces indicated to receive field paint, prepare and paint in accord with the requirements of the Painting and Coating section.
- E. Allowable tolerances: Field assembled mechanical joints shall fit within $\pm 1/32$ ". Install freestanding items to $\pm 1/4$ " of proper position.

3.3 REPAIR:

- A. Repair of galvanized surfaces: After installation, clean surfaces from which galvanizing was removed during installation in accord with SSPC-SP 3, Power Tool Cleaning. Coat surfaces with cold galvanizing compound in accord with ASTM A780-09 to achieve a minimum 3.0 mils dry film thickness.
- B. Repair of primed surfaces: After installation, clean damaged areas in shop primer to the same standards as required for the shop coat and paint using identical primer.

End of Section

SECTION 05 7325

ARCHITECTURAL ALUMINUM RAILINGS

PART 1 GENERAL

1.1 SUMMARY:

- A. Work of this section includes exterior aluminum railings.
- B. Related work specified elsewhere:
 - 1. Concrete.
 - 2. Anchoring cement.

1.2 PERFORMANCE REQUIREMENTS:

- A. Delegated design: Engage a registered professional engineer in the state of Georgia to design the railings.
- B. Structural performance of railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Component importance factor: 1.5.
 - 2. Top rails of guards:
 - a. Uniform load of 50 lbf/ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 3. Infill of guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
 - b. Infill load and other loads need not be assumed to act concurrently.
 - 4. Thermal movements: Allow for thermal movements from ambient and surface temperature changes.
 - a. Temperature change: 120 deg F, ambient; 180 deg F.
- C. Railings and guardrails shall comply with ADA requirements.

1.3 SUBMITTALS:

- A. Shop drawings: Indicate sizes, shapes, configuration, sections, locations, fabrication and installation details. Indicate fabricated sizes. Indicate that railings meet code requirements for vertical and horizontal loading. Include dimensioned plan of built-in anchorage devices, materials, finishes and itemization of parts and accessories.
- B. Product data: Indicate product description for specified coating system and instructions for preparation of surfaces to receive coatings, rates and methods of applications and finishes to be expected in finished work.
- C. Samples:
 - 1. Color and finish samples: Indicating colors and finishes to be expected in finished work.
 - 2. Railings: Submit full height by 2'-0" long sample of each type railing with post and rails, indicating construction, welded joints, and finish.

- D. Maintenance data: Submit for prefinished aluminum including cleaning materials, methods and precautions.
- E. Welder certification: Submit welders' qualifications in accord with AWS D1.2, current within the previous 6 months, for Architect's information only.
- F. Evaluation reports: For post-installed anchors, from ICC-ES.
- G. Delegated-design submittal: For railings, including analysis data signed and sealed by the registered professional engineer responsible for their preparation.

1.4 QUALITY ASSURANCE:

- A. Allowable tolerances:
 - 1. Machine field and shop assembled mechanical joints shall fit within $\pm 1/32$ ".
 - 2. Sizes of each element of an assembly shall be correct within 1/8"; total size of a freestanding assembly shall be correct within 1/2".
 - 3. Install railings plumb and aligned within 1/4" in 12'-0", and parallel with adjacent surfaces to within 1/4".
 - 4. Concrete block outs and inserts shall be spaced within $\pm 3/8$ ", aligned within $\pm 1/4$ " and plumbed within $\pm 1/8$ ".
- B. Applicable standards:
 - 1. Aluminum Association (AA), standards as referenced herein.
 - 2. American Architectural Manufacturers Association (AAMA), standards as referenced herein.
 - 3. ASTM International (ASTM), standards as referenced herein.
 - 4. American Welding Society (AWS).
 - a. AWS D1.2, "Structural Welding Code -Aluminum."
 - b. AWS B2.1, "Welding Procedure and Performance Qualification."
- C. Qualifications of welders:
 - 1. Welders employed on the work shall have passed qualification tests and shall be current within the past 6 months in the position for which employed, in accord with AWS D1.1 procedures.
 - 2. Contractor shall require any welder to retake the qualification test when, in Architect's opinion, welder's work creates a reasonable doubt as to the welder's proficiency. Requalification tests shall be conducted at no additional expense to Owner. Recertification shall be made to Architect after welder has passed the retest.
- D. Field measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure fitting of work.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Transport, deliver and store railings with expanded polystyrene pads or dunnage between units to prevent marring and chipping.
- B. Handle units in shop and at jobsite using fabric or other non-abrasive slings; use no metal or abrasive slings.

1.6 PROJECT/SITE CONDITIONS:

- A. Protection: Protect aluminum surfaces from contact with lime, mortar, cement, acids and other harmful surfaces and from careless handling, storage or machining.

1.7 WARRANTY:

- A. Endorse and forward to Owner manufacturer's five year finish warranty covering refinishing of fluoropolymer coating due to checking, crazing, peeling, chalking or fading, beginning at Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL MATERIAL REQUIREMENTS:

- A. Materials shall be free from defects impairing strength, durability or appearance. Exposed surfaces throughout project shall have the same inherent texture and color for like locations.
- B. Post-installed anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.
 - 1. Material for exterior locations and where stainless steel is indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593-13, and nuts, ASTM F 594-09.
 - 2. Exposed fasteners shall be of same materials, color and finish as material to which applied, shall be countersunk and finished flush.

2.2 MATERIALS:

- A. Extrusions: 6063 alloy, T5 or T6 temper, meeting ASTM B221-14; 0.125" minimum wall thickness.
- B. Pipe: 6063 alloy, T6 temper meeting ASTM B241-12; 0.125" minimum wall thickness. Pipe sizes indicated on the drawings are Nominal Pipe Sizes.
- C. Sheet and plate: 5005-H34 alloy meeting ASTM B209-14; minimum 0.050" thickness for sheet; 0.125" thickness for plate.
- D. Castings: 356-T6 alloy meeting ASTM B108-14.
- E. Bituminous paint: Cold-applied asphalt emulsion complying with ASTM D1187-97(2011).

2.3 FINISHES:

- A. Finish on exposed aluminum components:
 - 1. Two coat, shop-applied, baked-on fluoropolymer coating system based on minimum 70% Arkema Group, Kynar 500 or Solvay Solexis, Inc., Hylar 5000 resin (Polyvinylidene fluoride, PVDF), formulated by a licensed manufacturer and applied by manufacturer's approved applicator to meet AAMA 2605-05.
 - 2. Color: As selected by Architect from manufacturer's full range.
 - 3. Unexposed aluminum components: Mill finish.

2.4 RAILING FABRICATION:

- A. Fabricate aluminum railings in accord with approved shop drawings using mitered and welded joints and radius bends and returns as indicated on drawings.

- B. Shop fabricate to maximum extent possible. Fabricate railings up to 20'-0" long in one length.
- C. Form bends and wall returns in jigs to uniform radius, free of buckles, twists, cracks, grain separation or distortion of cross section or surface.
- D. Fabricate rails continuous between posts except as required for expansion control. Fit posts to continuous top rail and intermediate rails to post.
- E. Reinforce joints and splices with tight fitting internal connectors.
- F. Ends of handrails shall be rounded or returned to floor, wall or post as indicated on drawings. Close wall return ends using welded aluminum caps and grind smooth.
- G. Miter and cope intersections of posts and rails.
- H. Continuous weld components all around in accord with AWS standards to fuse without undercut, overlap or distortion of rail material.
- I. Grind exposed welds smooth and flush, matching and blending adjacent contours and surfaces without weakening base metal.
- J. Remove burrs and roughness from exposed cut edges of fabricated elements.
- K. Perform fabrication prior to shop finishing.
- I. Provide protected pressure relief and weep holes in exterior railings.

2.5 PREPARATION AND SHOP APPLICATION OF COATING SYSTEM:

- A. Surfaces to receive finishes shall be dry and free of debris, oils, dust or other deleterious materials.
- B. Prior to undercoat application clean metal surfaces in accord with SSPC-SP 1, Solvent Cleaning.
- C. Apply coating materials to clean surfaces in accord with manufacturer's product data to achieve specified dry film thicknesses. Apply materials using clean equipment of type recommended by system manufacturer's product data. Where railings cannot be manufactured in full length, mask at locations of field welds.
- D. Comply with manufacturer's product data for drying time between coats.
- E. Finish coats shall be smooth, free of streaks, laps or pile-up of coating materials, skipped or missed areas.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Inserts and anchorages:
 - 1. Furnish inserts, sleeves and anchoring devices to be set in concrete for installation of railing work.
 - 2. Provide back-up plates for bolted connections.
 - 3. Coat components and anchors to be built into concrete and masonry construction using bituminous paint, 15 mils minimum dry film thickness.

- B. Coordinate setting drawings, diagrams, templates, instructions and directions for installation of anchorages, concrete inserts, anchor bolts and items having integral anchors to be embedded in concrete construction.
- C. Shop assembly: Preassemble items in shop to greatest extent practicable to minimize assembly of units at project site. Disassemble units to extent necessary for shipping and handling limitations. Mark units for reassembly.

3.2 INSTALLATION:

- A. General:
 - 1. Set work in location, alignment and elevation, plumb and level, true and free of rack; measured from established lines and levels. Perform cutting, drilling and fitting required for installations of work. Install in accord with approved shop drawings.
 - 2. Secure railings to wall back-up plates as indicated on approved shop drawings.
 - 3. Set railings within specified installation tolerances as specified herein.
 - 4. Fit exposed connections together to form hairline joints.
- B. Protect aluminum in contact with masonry, steel, concrete or other dissimilar material using bituminous paint. Maintain exposed surfaces free of bituminous material.
- C. Setting posts:
 - 1. Clean and moisten concrete blockouts; clean sleeve inserts.
 - 2. Place, align and brace railing system; shim post at bottom of permanent blockout or oversized sleeve.
 - 3. Grout posts solid with anchoring cement as specified in Masonry Mortaring and Grouting section, flush with blockout edge and sloped up 1/8" onto post for drainage.
- D. Field connections:
 - 1. Splice railings in field using internal connectors.
 - 2. Weld joints continuous and grind smooth, flush with railing surface.
 - 3. Prepare field welded surfaces and surfaces damaged during shipping or installation to receive field finish by cleaning in accord with SSPC-SP 1, Solvent Cleaning. Prevent damage to shop applied finish.
 - 4. Touch-up: Field apply finish system to match shop applied finish, to field welds and to touch up damaged surfaces. Blend with existing finish.
- E. Expansion control: Provide 1/2" minimum expansion control joints at 30'-0" o. c. maximum. Secure internal connectors at expansion joints securely to one side, extending not less than 2" on each side of joint. Locate within 6" of posts.
- F. Just prior to Date of Substantial Completion, examine railings for damage. Repair or replace work damaged or stained by subsequent work.
 - 1. Touch up prefinished surfaces as specified for field welds.
 - 2. Clean factory painted aluminum components in accord with AAMA 610.1-02.

End of Section

SECTION 06 1000
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY:

- A. Related work specified elsewhere:
 - 1. Architectural woodwork.
 - 2. Gypsum board.

1.2 SUBMITTALS:

- A. Preservative-treated wood certification: Submit for Architect's information only. Submit certification by treating plant, stating chemicals and process used, net amount of salts retained, conformance with applicable standards and moisture content after treatment.
- B. Fire-retardant treatment certification: Submit for Architect's information only. Submit certification by treating plant that fire-retardant treatment materials comply with governing ordinances and that treatment will not bleed through finished surfaces.

1.3 QUALITY ASSURANCE:

- A. Applicable standards:
 - 1. ASTM International (ASTM), standards as referenced herein.
 - 2. Wood products; comply with the following standards published by the U. S. Department of Commerce, National Institute for Standards Technology (NIST):
 - a. Lumber: PS 20-10.
 - b. Construction and Industrial Plywood: PS 1-95.
 - 3. Preservative-treated wood: American Wood Protection Association (AWPA); current standards, as referenced herein, shall apply to preservative-treated wood products.
 - 4. Plywood: APA The Engineered Wood Association (APA), current standards.
 - 5. Grading rules; current grading rules of the following associations apply as applicable to wood products:
 - a. Southern Pine Inspection Bureau (SPIB).
 - b. Western Wood Products Association (WWPA).
 - c. West Coast Lumber Inspection Bureau (WCLIB).
 - d. National Lumber Grades Authority (NLGA).
- B. Design standards; spans, connections and design criteria for members not otherwise indicated shall comply with the following:
 - 1. American Forest and Paper Association (AF&PA).
 - a. "National Design Specifications for Wood Construction".
 - b. "Design Values for Joists and Rafters".
 - c. "Span Tables for Joists and Rafters".
- C. Product identification:
 - 1. Lumber: Lumber shall bear the grade stamp of a listed grading rules association certified by the Board of Review of the American Lumber Standards Committee (ALSC), identifying species or species combination, grade, moisture condition at time of surfacing, mill of origin and grading agency.

2. Plywood: Plywood shall bear the stamp of the APA The Engineered Wood Association (APA), indicating type, grade, thickness, exposure durability, span rating, agency compliance, species group, edging, finish and glue type.
 3. Preservative-treated wood products: Preservative-treated lumber and plywood shall bear the quality standard stamp of the applicator, indicating preservative type, exposure conditions, year of treatment, treatment plant and treatment supervising agency.
 4. Fire-retardant-treated wood products: Fire-retardant-treated lumber and plywood shall bear the stamp of Underwriters Laboratories, Inc., (UL) or other approved independent inspection agency, indicating treatment type or name, flame spread and treatment plant.
- D. Engineered Wood Products:
1. Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
 2. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

1.4 DELIVERY, STORAGE AND HANDLING:

- A. Upon delivery to project site, place materials in areas protected from weather.
- B. Store materials a minimum of 6" above ground on blocking and cover with waterproof covering. Provide for air circulation and ventilation.
- C. Store no seasoned materials in wet or damp portions of building.
- D. Protect sheet materials from breaking corners and damaging surfaces.

PART 2 - PRODUCTS

2.1 LUMBER:

- A. Species and standards: Grade-stamped commercial softwood conforming to PS 20 and referenced grading rules, unless otherwise indicated.
- B. Seasoning: 19% maximum moisture content at time of building enclosure, unless otherwise noted.
- C. Surfacing: Surfaced four sides (S4S).
- D. Dimensions: Indicated lumber dimensions are nominal. Comply with PS 20.
- E. Plates, blocking, bracing and nailers: Utility Grade or #3 Southern Pine.

2.2 TREATED WOOD PRODUCTS:

- A. Pressure-preservative-treated wood:
 1. Treatment type: Water-borne preservative registered with EPA.

2. AWP standard:
 - a. Lumber, timber and plywood shall conform to applicable requirements of AWP Standard U1-07 and T1-07 for species, product and end use.
 - b. Handling and care of pressure treated wood products shall conform to AWP Standard M4-06.
 - c. Preservatives shall conform to AWP P5-07.
 3. Preservative retention: As required by treatment type in accord with AWP Standards for below- or above-ground use.
 4. Seasoning; re-dry after treatment to 19% maximum moisture content.
 5. Use:
 - a. Wood products in contact with concrete slabs-on-grade or foundations.
 - b. Nailers or blocking cast or built into concrete or masonry.
 - c. Wood products in contact with exterior walls.
 - d. Blocking, nailers, plates and similar wood products in conjunction with roof decks, roofing and roof parapets.
- B. Interior fire-retardant-treated wood:
1. Acceptable product; subject to compliance with specified requirements:
 - a. Hickson Corporation, Dricon.
 - b. Hoover Treated Wood Products, Pyro-Guard.
 - c. Viance, LLC, D-Blaze.
 2. Description: Pressure-impregnated with a chemical retardant tested and listed by Underwriters Laboratories, Inc., (UL). When tested in accord with ASTM E84-15 treated products shall have a flame spread of 25 or less and show no evidence of significant progressive combustion when the test is continued for an additional twenty minute period. In addition, flame front shall not progress more than 10'-6" beyond centerline of burners at any time during test.
 3. Surface burning characteristics: F.R.-S rating in accord with Underwriters Laboratories, Inc. (UL).
 4. AWP standard: AWP U1-07, T1-07 and P17-02.
 5. Seasoning; kiln-dried after treatment to the following maximum moisture content:
 - a. Lumber: 19%.
 - b. Plywood: 15%.
 6. Hygroscopicity: Maximum 28% equilibrium moisture content when tested in accord with ASTM D3201-13 at 92% relative humidity.
 7. Use: As required by codes.

2.3 HARDWARE:

- A. Power-driven fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- B. Post-installed anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC58, ICC-ES AC193 or ICC-ES AC308 as appropriate for the substrate.
- C. Provide nails, bolts, nuts, washers, screws, expansion bolts, clips, powder-actuated fasteners and similar hardware necessary for complete installation of rough carpentry items.
 1. Material and finish of fasteners in contact with non-pressure treated and fire-retardant-treated components shall be G90 hot dip galvanized steel or Type 304 stainless steel, except nails shall be hot dip galvanized.

2. Material and finish of fasteners in contact with pressure-preservative-treated components shall be one of the following:
 - a. G185 hot-dip galvanized steel.
 - b. Type 316L stainless steel.

2.4 ADHESIVES:

- A. Adhesives for gluing furring and sleepers to concrete or masonry: Formulation complying with ASTM D3498-03(2011) that is approved for use indicated by adhesive manufacturer.
 1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL:

- A. Install wood framing and rough carpentry work cut square on bearings, fitted and set to required lines and levels, and secured in place.
- B. Lay out the work to provide correct openings to receive work of other trades.
- C. Framing with engineered wood products: Install engineered wood products in accord with manufacturer's product data.
- D. Preservative-treated wood:
 1. Prior to installation, brush-apply preservative to cut edges and ends of wood, using same type of preservative used for pressure treatment.
 2. Handle and install in accord with AWPA standards.
- E. Fire-retardant-treated wood:
 1. Prevent exposure to water or moisture, and do not use if so exposed.
 2. Only end cuts shall be made. Do not rip or re-surface.
 3. Attach using only hot dip galvanized nails and anchors.
- F. Plates, blocking, nailers and miscellaneous framing:
 1. Provide 2" nominal thickness members to support and secure finishing materials, fixtures, accessories, partitions, specialty items and trim.
 2. Bolt to structural steel or metal framing at 4'-0" o. c., maximum.
 3. Secure to concrete and masonry using cast-in bolts, powder-activated stud, sleeve or wedge type anchors spaced at 4'-0" o. c., maximum.
 4. Provide anchors within 3" of ends of members.
 5. Provide linear runs in maximum practicable lengths, with joints in multiple members offset 3'-0", minimum.
 6. Around roof perimeter and at roof penetrations, provide blocking equal to roof insulation thickness. Attach through decking into structural members at 2'-0" o. c., maximum, starting within 3" of each end. Space ends 1/2" for venting.
 7. Install furring vertically at 2'-0" o. c., maximum. Secure to concrete or masonry with adhesive and appropriate fasteners spaced at 2'-0" o. c., maximum.

- G. Attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
 2. ICC-ES evaluation report for fastener.
- H. Site tolerances:
1. Variation from plumb: 1/4" in 10'-0" height, non-cumulative,
 2. Variation from horizontal squaring diagonals: 1/2".
 3. Variation from indicated location of framing: $\pm 1/4$ ".
 4. Location of dimensioned openings: $\pm 3/8$ ".
 5. Variation from indicated rough opening size: +1/4", -1/8".

End of Section

SECTION 06 4000

ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY:

- A. Work of this section includes factory-fabricated woodwork including plastic laminate finished millwork.
- B. Related work:
 - 1. Rough carpentry.
 - 2. Solid surfacing fabrications.

1.2 SUBMITTALS:

- A. Shop drawings: Submit for architectural woodwork. Indicate construction and installation details, species and grades of materials, finishes, plastic laminate and cabinet hardware selections.
- B. Product data: Submit for cabinet hardware and similar manufactured items. Submit with shop drawings.
- C. Samples for verification:
 - 1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with one sample applied to core material and specified edge material applied to one edge.
 - 2. Wood-grain plastic laminates, 12 by 24 inches, for each type, pattern and surface finish, with one sample applied to core material and specified edge material applied to one edge.
 - 3. Thermoset decorative panels, 8 by 10 inches, for each color, pattern, and surface finish, with edge banding on one edge.
 - 4. Hardware items: Submit if requested by Architect. Samples will be returned to supplier.

1.3 QUALITY ASSURANCE:

- A. Applicable standards; comply with the following:
 - 1. Standards of the following, as referenced herein:
 - a. American National Standards Institute (ANSI).
 - b. APA The Engineered Wood Association (APA).
 - c. ASTM International (ASTM).
 - d. American Wood Protection Association (AWPA).
 - e. Hardwood Plywood and Veneer Association (HPVA).
 - f. National Electric Manufacturers Association (NEMA).
 - 2. Wood products; standards of the U. S. Department of Commerce, National Institute of Standards and Testing:
 - a. Lumber: PS 20-10.
 - b. Construction and Industrial Plywood: PS 1-95.
 - 3. Standards for architectural woodwork: Architectural Woodwork Institute (AWI/AWS), "Architectural Woodwork Standards, 2nd Edition, October 1, 2014, herein referred to as AWS Standards. Work shall comply with applicable portions of AWS standards.

- B. Grade marks: Identify lumber and plywood by official grade mark.
 - 1. Lumber: Grade stamp shall contain symbol of grading agency, mill number or name, grade of lumber, species or species grouping or combination designation, rules under which graded where applicable, and condition of seasoning at time of manufacture.
 - 2. Plywood: Appropriate grade trademark of the APA. Indicate type, grade, class, identification index and inspection and testing agency mark.
 - 3. On components to be exposed to view, grade marks shall be located so as to be concealed in finished work.

- C. Fabricator/installer qualifications:
 - 1. Architectural woodwork shall be fabricated and installed by a single manufacturer.
 - 2. Fabricator/installer shall have at least five years successful experience in the fabrication, finishing and installation of architectural woodwork of the type and quantity required and, if requested by Architect, shall submit evidence of such experience.

- D. Pre-installation conference:
 - 1. Prior to beginning work, a pre-installation conference will be held to review work to be accomplished.
 - 2. Contractor, fabricator/installer and Architect shall be present.
 - 3. Contractor's submittals will be reviewed.
 - 4. Substrates and conditions under which woodwork shall be installed will be reviewed.
 - 5. Contractor shall notify all parties at least seven days prior to time of conference.
 - 6. Contractor shall record minutes of meeting and distribute to all parties in attendance.

1.4 DELIVERY, STORAGE AND HANDLING:

- A. Deliver no woodwork to project site until areas are ready for woodwork installation.
- B. Immediately upon delivery to job site, place woodwork indoors, protected from weather.
- C. Store woodwork a minimum of 6" above floor on blocking and cover with waterproof covering. Provide for air circulation and ventilation. Store in dry, conditioned space.
- D. Wrap prefinished woodwork in protective covering for shipping and storage. Protect from sunlight exposure.

1.5 PROJECT CONDITIONS:

- A. Field measurements: Take field measurements to ascertain exact woodwork sizes. Indicate exact dimensions on shop drawings.
- B. Install no interior woodwork until spaces are enclosed, dry and conditioned. Maintain temperature between 55 degrees F. and 80 degrees F. for 72 hours before beginning installation and afterwards until Date of Substantial Completion.
- C. Maintain interior relative humidity at the site between 25% and 55% before, during, and after installation.

PART 2 - PRODUCTS

2.1 BASIC MATERIALS:

- A. Lumber for opaque finish:
 - 1. Species: Poplar.
 - 2. Lumber grade: Grade II.
 - 3. Moisture content: 8-13%.
 - 4. Locations: As indicated on drawings.

- B. Veneer-faced hardwood plywood:
 - 1. Meeting HPVA HP-1. Plywood shall be made without urea-formaldehyde adhesive.
 - 2. Plywood shall conform to AWS Section 4 Standards for millwork grade specified.
 - 3. Plywood shall be APA A-A, A-B or A-D, Exposure 1 Grade, Group 1; "A" face for exposed surfaces, "B" face for semi-exposed surfaces, "D" face for unexposed surfaces.

- C. Medium-density fiberboard (MDF):
 - 1. Acceptable manufacturers:
 - a. Flakeboard Co., South Carolina and Oregon.
 - b. SierraPine, Oregon.
 - c. Clarion Boards, Inc., Pennsylvania.
 - d. Temple-Inland Forest Products Corp., Pennsylvania.
 - e. Unilin US, North Carolina.
 - 2. Characteristics: Meeting ANSI A208.2; Grade 130, minimum 40 pcf density; moisture-resistant. MDF shall have no added urea-formaldehyde resins.

- D. Hardboard: AHA A135.4, 1/4" thickness, tempered.

- E. Plastic laminates:
 - 1. Acceptable products:
 - a. Formica Corp., Formica.
 - b. Panolam Industries International, Inc., Nevamar.
 - c. Wilsonart International, Inc., Wilsonart.
 - 2. Conforming to NEMA Standard LD3-2005, as follows:
 - a. Horizontal applications: Grade HGL.
 - b. Vertical applications: Grade VGL.
 - c. Cabinet-liner: Grade CL-20.
 - d. Backing sheet: Grade BKL, undecorated plastic laminate.
 - e. Post-forming applications: Grade HGP.
 - f. Chemical resistant applications: Grade VGP.
 - g. Fire-resistant applications: Grade VGF.
 - h. Solid color applications: Grade HGS.
 - 3. Colors, textures and patterns: As selected by Architect from laminate manufacturer's standard full line selection.
 - 4. Provide abuse-resistant laminates for exposed portions of the work.

- F. Thermoset decorative panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
 - 1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semi-exposed edges.
 - 2. Color, gloss, texture and pattern as selected by Architect from manufacturer's standard color selection.
 - 3. Location: Cabinet interiors.

G. Composite wood products: Products shall be made without urea formaldehyde.

2.2 ARCHITECTURAL CABINETS:

- A. Plastic laminate clad cabinets:
1. AWS quality grade: Custom.
 2. Panel core: Particleboard or hardwood plywood.
 3. Finish on exposed surfaces: Plastic laminate as specified herein.
 4. Finish on semi-exposed surfaces: Thermoset decorative panels:
 5. Component edges: Plastic laminate faced.
- B. Tops:
1. Plastic laminate:
 - a. AWS quality grade; Custom.
 - b. Core: Medium density fiberboard.
 - c. Non-exposed surface: Backing sheet.
 2. Solid surfacing: See Solid Surfacing Fabrications section.

2.3 MISCELLANEOUS WOODWORK:

- A. Comply with AWS Standards as follows:
1. Standing and running trim: Section 6, Custom Grade.
 2. Shelving: Section 6, Custom Grade.

2.4 HARDWARE:

- A. Door and drawer pulls:
1. Acceptable products:
 - a. Epcos, Inc., #MC-402/2-4.
 - b. Sugatsune America, Inc., #SST-30M.
 - c. Stanley Works #4484, 4" long.
 2. Type: 4" long wire pull, satin stainless steel finish.
- B. Concealed hinges:
1. Acceptable products:
 - a. Grass America, Inc., #3903.
 - b. Julius Blum, Inc., #71.6500 Series.
 - c. Sugatsune America, Inc., #H160-C.
 2. Type: 165 degree opening, self-closing.
- C. Recessed shelf standards and supports:
1. Acceptable manufacturers:
 - a. Basis of design: Knappe and Vogt Mfg. Co., #255 standard with #256 support.
 - b. Stanley Works.
 - c. Johnson Hardware, Inc.
 - d. Sugatsune America, Inc.
 - e. Hafele America Co.
 2. Type: Steel.
 3. Finish: Finish as selected by Architect.
- D. Surface-mounted shelf standards and supports:
1. Acceptable manufacturers:
 - a. Basis of design: Knappe & Vogt Mfg. Co., #80 standards with #180 brackets.
 - b. Capitol Hardware, Inc.
 - c. Garcy Corp.
 - d. Stanley Works.

- e. Johnson Hardware, Inc.
 2. Type: Steel.
 3. Finish: Finish as selected by Architect.
- E. Heavy-duty shelf standards and supports:
 1. Acceptable manufacturers:
 - a. Basis of design: Knape and Vogt Mfg. Co., #87 Heavy-Duty Standard with #186/187 Heavy-Duty Brackets.
 - b. Stanley Works.
 - c. Johnson Hardware, Inc.
 - d. Sugatsune America, Inc.
 - e. Hafele America Co.
 2. Type: Steel, heavy-duty applications.
 3. Finish: Finish as selected by Architect.
- F. Side mount drawer slides:
 1. Acceptable products:
 - a. Basis of design: Accuride, #3832.
 - b. Grant Hardware Co., #5632.
 - c. Knape and Vogt Mfg. Co., #1429.
 2. Type: Full extension, steel ball bearing.
 3. Capacity: 100 lb. capacity:
- G. Cabinet drawer/door lock:
 1. Acceptable products:
 - a. Knape and Vogt Mfg. Co., #986.
 - b. Sugatsune America, Inc., #3310.
 - c. Timberline Supply, Ltd., Style CB-230 deadlock and Type 230 cylinder body with lock plug.
 2. Finish: Nickel-plated.
- H. Wire management grommet:
 1. Acceptable products:
 - a. Outwater Plastics, Inc., #31-2".
 - b. Sugatsune America, Inc., #V60-B.
 - c. Hafele America, Inc.
 2. Provide set including grommet, grommet cap and slot cover; color as selected by Architect from manufacturer's standard selection.
- I. Fasteners: Provide bolts, nails, screws, toggle bolts and similar fasteners as indicated or required to attach and secure work.
 1. Fasteners for trim shall be finishing nails for attachment to wood framing, trim-head screws for attachment to metal framing.
 2. Material and finish of fasteners in contact with non-pressure treated and fire-retardant-treated components shall be G90 hot dip galvanized steel or Type 304 stainless steel, except nails shall be hot dip galvanized.
 3. Material and finish of fasteners in contact with pressure-treated components shall be G185 hot-dip galvanized steel or Type 316L stainless steel.

2.6 ADHESIVES:

- A. Adhesives: Do not use adhesives that contain urea formaldehyde.
- B. Adhesive for bonding plastic laminate: Unpigmented contact cement.
- C. Adhesive for bonding edges: Hot-melt adhesive or adhesive specified above for faces.

2.7 FABRICATION:

A. General:

1. Quality grade for architectural woodwork shall be AWS Custom Grade.
2. Fabricate architectural woodwork in accord with approved shop drawings.
3. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
4. Seal faces and edges of medium density fiberboard indicated to be sealed or finished.
5. Perform veneer operations using hot press method using moisture-resistant, fire-retardant adhesives.
6. Shop-assemble for delivery to site in units easily handled and to permit passage through building openings. Items which cannot be manufactured in one piece shall have joints at logical breaking points and shall be so noted on shop drawings.
7. Apply plastic laminate sheets in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.
8. Cap exposed plastic laminate finish edges with material of same finish and pattern.
9. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
10. Scribe, miter and accurately join members.
11. Finish work shall be smooth, free from abrasion, tool marks, open joints or raised grain on exposed surfaces.

B. Casework:

1. Fit shelves, doors and exposed edges with plastic laminate edging. Use one piece for full length only.
2. Where countertops can not be provided in single length, join using compression type fasteners.
3. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, fixtures and fittings. Verify locations of cutouts from onsite dimensions. Seal contact surfaces of cut edges.

C. Standing and running trim:

1. Shop prepare and identify components for grain matching during site erection.
2. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for searching and site cutting.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Prior to pre-installation conference, examine substrates and conditions to receive work. Check that floors and wall substrates are level, plumb and within tolerances to receive work specified in this section.
- B. Verify mechanical, electrical and building items affecting work of this section are placed and ready to receive architectural woodwork.
- C. Do not begin work until unsatisfactory substrates or conditions have been corrected.

3.2 GENERAL WORKMANSHIP:

- A. Install woodwork in a manner consistent with the specified Quality Grade, plumb, level, true and straight within 1/8" in 10'-0". Shim as required using concealed shims.
- B. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing.
 - 1. Use fixture attachments in concealed locations for wall mounted components.
 - 2. Secure cabinet and counter base to floor using angles and anchorages.
- C. Scribe and cut for accurate fit to other finished work, with maximum gap of 1/32". Do not use addition overlay trim to conceal larger gaps.
- D. Use concealed joint fasteners to align and secure adjoining cabinet units and countertops.
- E. Before making cutouts, drill pilot holes at corners.
- F. Finish work shall be smooth, free from abrasion, tool marks, raised grain grade markings or similar defects on exposed surfaces.
- G. Distribute defects allowed in the quality grade specified to the best overall advantage when installing job assembled work. Install work in accord with approved shop drawings.
- H. Touch up mill finished items, including refinishing necessitated by job fitting or attaching and repair of scratches and similar damages. Touch up repairs shall be indiscernible in the finished work.

3.3 INSTALLATION OF STANDING AND RUNNING TRIM:

- A. Trim and moldings: Install in single unjointed lengths for openings and for runs less than 10'-0". For longer runs, use only one piece less than 10'-0" in straight runs with no piece being less than 4'-0" in length. Join lengths with beveled butt joints. Stagger joints in adjacent members. Cope at returns and miter at corners.
- B. Attach and secure in place with uniform joints providing for thermal and building movements.
- C. Attachment: Blind anchor where possible. Use finishing nails or trim-head screws where exposed. Set exposed heads for filling. Secure work to framing, anchors or blocking which is built in or directly attached to structural elements.

3.4 FIELD FINISHING:

- A. Field finish: Field finish painted woodwork in accord with the requirements of the Painting and Coating section. Prior to finishing, sand using 120 to 180 grit abrasive on a smooth sanding block, to remove scuff and handling marks, raised grain, scratches and effects of moisture exposure.

3.5 CLEANING AND PROTECTION:

- A. Protect finished and prefinished surfaces from work of other trades.

- B. Prior to Date of Substantial Completion, examine work for damages. Repair or replace such damaged work to original condition.
- C. Clean wood, metal and accessory items using a neutral cleaner. Check and correct operating mechanism for proper operation. Adjust and lubricate hinges, catches and other operating hardware.

End of Section

SECTION 06 6116

SOLID SURFACING FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY:

- A. Work of this section includes:
 - 1. Lavatory tops.
 - 2. Window sills.
 - 3. Integral sinks and bowls.

1.2 REFERENCES:

- A. Applicable standards: Standards of the following, as referenced herein:
 - 1. American National Standards Institute (ANSI).
 - 2. ASTM International (ASTM).

1.3 SUBMITTALS:

- A. Shop drawings: Indicate dimensions, component sizes, fabrication details attachment provisions and coordination requirements with adjacent work.
- B. Samples: Submit minimum 6" by 6" samples. Indicate full range of color and pattern variation. Approved samples will be retained as a standard for work.
- C. Product data: Indicate product description, fabrication information and compliance with specified performance requirement.
- D. Maintenance data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in project closeout documents.

1.4 DELIVERY, STORAGE AND HANDLING:

- A. Deliver no components to project site until areas are ready for installation. Store indoors.
- B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.5 WARRANTY:

- A. Provide manufacturer's warranty against defects in materials. Warranty shall provide for replacement material and labor for a period of ten (10) years, beginning at Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ACRYLIC SOLID SURFACING MATERIAL:

- A. Acceptable products:
 - 1. LG Hausys, HI-MAcs.
 - 2. E. I. du Pont de Nemours & Co., Inc., Corian.
 - 3. Aristech Surfaces, Avonite.
 - 4. Hanwha L&C Surfaces, Hanex
 - 5. Wilsonart International, Solid Surface.

- B. Material: Cast, 100% acrylic resin, solid, structural surfacing material.
 - 1. Material shall be through-patterned and homogeneous. No coated materials nor non-homogeneous materials allowed.

- C. Characteristics:
 - 1. Finish: Matte (Gloss rating of 5-20).
 - 2. Thickness: Minimum 1/2".
 - 3. Colors: As selected by Architect from manufacturer's full range.
 - 4. Tops:
 - a. Provide configurations indicated. Provide full-length units for lengths shorter than 10'-0".
 - b. Provide backsplashes, endsplashes and aprons as indicated.
 - c. Bowls shall be integral with and same material and appearance as surrounding tops.

2.2 QUARTZ SOLID SURFACING MATERIAL:

- A. Acceptable manufacturers:
 - 1. Cambria.
 - 2. Cosentino USA, Inc., Silestone.
 - 3. E. I. du Pont de Nemours & Co., Inc., Zodiaq.
 - 4. Hanwha L&C Surfaces, Hanstone.
 - 5. U.S. Quartz Products, CaesarStone.
 - 6. LG Hausys, Viatera Quartz.

- B. Characteristics:
 - 1. Composition: Quartz aggregate, resin, and color pigments formed into flat slabs. Quartz content shall be minimum 93%.
 - 2. Colors: As scheduled on the drawings.
 - 3. Thickness: Minimum 3/4" with built-up edges as selected by Architect.
 - 4. Tops:
 - a. Provide configurations indicated. Provide full-length units for lengths shorter than 10'-0".
 - b. Provide backsplashes, endsplashes and aprons as indicated.
 - c. Bowls shall be undermount (underslung) porcelain bowls as specified in Division 22, Plumbing.
 - 5. Joint sealer/adhesive: Manufacturer's recommended low-VOC joint sealer/adhesive, colors as selected by Architect from surfacing manufacturer's full color range.

2.3 INSTALLATION MATERIALS:

- A. Adhesive: Product recommended by solid surface material manufacturer.

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

- C. Sealant for countertops: Comply with applicable requirements in Joint Sealants section.

- D. Sink/bowl mounting hardware: Manufacturer's approved bowl clips, brass inserts and fasteners for attachment of undermount sinks/bowls.

2.4 FABRICATION:

- A. Factory-fabricate components to greatest extent practicable, to sizes and shapes indicated, in accord with approved shop drawings.

- B. Form joints between components using manufacturer's standard joint adhesive; without conspicuous joints and without voids. Attach a 2" wide reinforcing strip of solid surfacing under each joint.
- C. Provide factory cutouts for plumbing fittings and bath accessories as indicated.
- D. Rout and finish component edges to a smooth, uniform finish. Rout cutouts and sand edges smooth. Machine radii and contours to template. Repair or reject defective and inaccurate work.
- E. Edge treatment for tops: As indicated on drawings.

2.5 SOURCE QUALITY CONTROL:

- A. Allowable tolerances:
 - 1. Variation in component size: $\pm 1/8"$.
 - 2. Location of openings: $\pm 1/8"$ from indicated location.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Install components plumb, level and rigid, scribed to adjacent finishes, in accord with approved shop drawings and product data.
- B. Form field joints using specified adhesive, with joints inconspicuous in finished work.
- C. Install undermount sinks/bowls to countertops using specified adhesive, sealants and mounting hardware.
- D. Provide back and end splashes as indicated. Adhere to countertops using specified color-matched silicone adhesive.
- E. Keep components clean during installation. Remove adhesives, sealants and other stains. Keep clean until Date of Substantial Completion. Replace stained components.
- F. Make plumbing connections to sinks in accord with Division 22, Plumbing.

3.2 PROTECTION:

- A. Protect surfaces from damage until Date of Substantial Completion. Repair or replace damaged work which cannot be repaired.

End of Section

SECTION 07 0150

PREPARATION FOR REROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Tear-off of entire roof.
 - 2. Removal of base flashings.
 - 3. Temporary roofing.
- B. Related Requirements:
 - 1. Summary section for use of the premises and phasing requirements.
 - 2. Temporary Facilities and Controls section for temporary construction and environmental-protection measures for reroofing preparation.

1.2 UNIT PRICES

- A. Work of this Section is affected by insulation removal and replacement unit price and metal deck removal and replacement unit price.

1.3 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.
- B. Partial Roof Tear-Off: Removal of selected components and accessories from existing roofing system.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, sections, and details.
- C. Temporary Roofing Submittal: Product data and description of temporary roofing system.

1.5 INFORMATIONAL SUBMITTALS

- A. Fastener pull-out test report.
- B. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, that might be misconstrued as having been damaged by reroofing operations. Submit before Work begins.
- C. Landfill Records: Indicate receipt and acceptance of demolished roofing materials and hazardous wastes, such as asbestos-containing materials, by a landfill facility licensed to accept them.

1.6 QUALITY ASSURANCE

- A. Regulatory requirements: Comply with governing EPA notification regulations before beginning roofing removal. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Reroofing conference: Conduct conference at Project site.
 - 1. Meet with Owner; Architect; Owner's insurer if applicable; testing and inspecting agency representative; roofing system manufacturer's representative; roofing Installer, including project manager, superintendent, and foreman; and installers whose work interfaces with or affects reroofing, including installers of roof deck, roof accessories, and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing system tear-off and replacement, including, but not limited to, the following:
 - a. Reroofing preparation, including roofing system manufacturer's product data.
 - b. Temporary protection requirements for existing roofing system components that are to remain.
 - c. Existing roof drains and roof drainage during each stage of reroofing, and roof-drain plugging and plug removal.
 - d. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to avoid delays.
 - e. Existing roof deck conditions requiring notification of Architect.
 - f. Existing roof deck removal procedures and Owner notifications.
 - g. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
 - h. Structural loading limitations of roof deck during reroofing.
 - i. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect reroofing.
 - j. HVAC shutdown and sealing of air intakes.
 - k. Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
 - l. Governing regulations and requirements for insurance and certificates if applicable.
 - m. Existing conditions that may require notification of Architect before proceeding.

1.7 FIELD CONDITIONS

- A. Existing Roofing System: Built-up asphalt roofing.
- B. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
- C. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.
- D. Limit construction loads on roof to rooftop equipment loads and for uniformly distributed loads. Wheel loads and uniform loads shall not exceed structural capacity of existing insulation and existing roof deck.

- E. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
 - 1. Remove only as much roofing in one day as can be made watertight in the same day.
- F. Hazardous Materials: It is not expected that hazardous materials, such as asbestos-containing materials, will be encountered in the Work.
 - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

PART 2 - PRODUCTS

2.1 TEMPORARY PROTECTION MATERIALS

- A. Expanded Polystyrene (EPS) Insulation: ASTM C 578.
- B. Plywood: DOC PS1, Grade CD Exposure 1.
- C. OSB: DOC PS2, Exposure 1.

2.2 TEMPORARY ROOFING MATERIALS

- A. Design and selection of materials for temporary roofing are Contractor's responsibilities.

2.3 INFILL AND REPLACEMENT MATERIALS

- A. Use infill materials matching existing roofing system materials unless otherwise indicated.
 - 1. Infill materials are specified in PVC Mechanically Attached Roofing section, unless otherwise indicated.
- B. Wood blocking, curbs, and nailers are specified in Rough Carpentry section.
- C. Plywood Parapet Sheathing: Pressure-preservative-treated plywood wall sheathing, complying with Rough Carpentry section.

2.4 AUXILIARY REROOFING MATERIALS

- A. General: Use auxiliary reroofing preparation materials recommended by roofing system manufacturer's product data for intended use and compatible with components of existing and new roofing system.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Shut off rooftop utilities and service piping before beginning the Work.
- B. Test existing roof drains to verify that they are not blocked or restricted. Immediately notify Architect of any blockages or restrictions.

- C. Shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.
- D. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
- E. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
 - 1. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under existing roofing system components that are to remain.

3.2 ROOF TEAR-OFF

- A. General: Notify Owner each day of extent of roof tear-off proposed for that day.
- B. Remove loose aggregate from aggregate-surfaced built-up bituminous roofing using a power broom.
 - 1. Discard board insulation that is damaged or is water soaked.
 - 2. Store board insulation for reuse and protect from physical damage.
 - 3. Remove and salvage for reuse, existing copings and gravel stop/fascia materials. Temporarily store on site and clean and prepare for reinstallation.
- C. Full roof tear-off: Where indicated, remove existing roofing and other roofing system components down to the deck.
 - 1. Remove substrate board, roof insulation and cover board.
 - 2. Remove wood blocking, curbs, and nailers.
 - 3. Remove excess asphalt from steel deck. A maximum of 15 lb/100 sq. ft. of asphalt is permitted to remain on steel decks.
- D. Remove fasteners from deck.

3.3 DECK PREPARATION

- A. Inspect deck after tear-off of roofing system.
- B. If broken or loose fasteners that secure deck panels to one another or to structure are observed, or if deck appears or feels inadequately attached, immediately notify Architect. Do not proceed with installation until directed by Architect.
- C. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect. Do not proceed with installation until directed by Architect.
- D. Replace steel deck as directed by Architect. Deck replacement will be paid for by adjusting the Contract Sum according to unit prices included in the Contract Documents.

- E. Prepare and paint steel deck surface. Painting and preparation for painting is specified in Painting and Coating section.

3.4 INFILL MATERIALS INSTALLATION

- A. Immediately after roof tear-off, and inspection and repair, if needed, of deck, fill in tear-off areas with new insulation to match existing roofing system construction.
 - 1. Installation of infill materials is specified in PVC Mechanically Attached Roofing section.
 - 2. Installation of wood blocking, curbs, and nailers is specified in Rough Carpentry section.
- B. Install new roofing patch over roof infill area. If new roofing is installed the same day tear-off is made, roofing patch is not required.

3.5 TEMPORARY ROOFING

- A. Install approved temporary roofing over area to be reroofed.
- B. Remove temporary roofing before installing new roofing.

3.6 BASE FLASHING REMOVAL

- A. Remove existing base flashings. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.
- B. Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings specified in Sheet Metal Flashing and Trim section.
- C. Inspect parapet sheathing, wood blocking, curbs, and nailers for deterioration and damage. If parapet sheathing, wood blocking, curbs, or nailers have deteriorated, immediately notify Architect.
- D. When directed by Architect, replace parapet framing, wood blocking, curbs, and nailers to comply with Rough Carpentry section.

3.7 FASTENER PULL-OUT TESTING

- A. Perform fastener pull-out tests according to SPRI FX-1, and submit test report to roofing manufacturer before installing new roofing system.
 - 1. Obtain roofing manufacturer's approval to proceed with specified fastening pattern. Roofing manufacturer may furnish revised fastening pattern commensurate with pull-out test results.

3.8 DISPOSAL

- A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
 - 1. Storage or sale of demolished items or materials on-site is not permitted.
- B. Transport and legally dispose of demolished materials off Owner's property.

End of Section

SECTION 07 1100

DAMPPROOFING

PART 1 - GENERAL

1.1 SUBMITTALS:

- A. Product data: Submit manufacturer's product specifications and installation instructions, including rates of application for each type installation specified.

1.2 QUALITY ASSURANCE:

- A. Applicable standards: Standards of ASTM International (ASTM), as referenced herein.
- B. Completed dampproofing application shall be pin-hole free.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL:

- A. Source limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide auxiliary materials recommended in writing by manufacturer of primary materials.
- B. VOC content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise required.

2.2 CAVITY WALL DAMPPROOFING:

- A. Acceptable products; subject to compliance with specified requirements:
 - 1. BASF Building Products, MasterSeal 615.
 - 2. Karnak Corp., #220AF Fibered Emulsion Dampproofing.
 - 3. Lambert Corp., Lambco Waterban® 60SM.
 - 4. W. R. Meadows, Inc., SEALMASTIC™ Emulsion Type 2 Dampproofing.
- B. Characteristics: Cold-applied, semi-fibrated, asphalt emulsion containing non-asbestos fiber, meeting ASTM D1187-97(2011), Type 1 and ASTM D1227-13, Type 2, Class I; brush- or spray-applied.
- C. Primer: Type recommended by dampproofing manufacturer for application to concrete unit masonry and concrete substrates.
- D. Reinforcing fabric for joints and abutting dissimilar substrates: Glass fiber mat reinforcement as recommended by dampproofing manufacturer.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION:

- A. Prior to application of materials, remove dirt, grease, mortar droppings and other foreign matter from substrate.
- B. Prime wall surfaces prior to dampproofing application, as required by manufacturer's product data.

- C. Apply dampproofing at temperatures above 40 degrees F., to dry, cured surfaces.
- D. Preparation at joints and abutting dissimilar substrates: Apply one coat of dampproofing and fully embed a layer of specified glass fiber mat reinforcement into wet dampproofing. Reinforcement shall span joints and junctures and lap onto adjacent surfaces a minimum of 3" each side. Apply topcoat of dampproofing to all surfaces as further specified.

3.2 CAVITY WALL APPLICATION:

- A. Spray- or brush-apply dampproofing in a minimum of two coats, in accord with manufacturer's product data, at a rate to achieve minimum total wet film thickness of 1/16".
- B. Apply dampproofing to exterior face of interior masonry wythe in exterior double wythe walls.

3.3 CLEAN UP:

- A. Protect adjacent finished surfaces from damage or staining from this work by masking prior to application. Repair or replace surfaces damaged or stained by dampproofing work.
- B. At completion of dampproofing operations, remove debris resulting from work, including spilled materials.

End of Section

SECTION 07 2800
ELASTOMERIC COATINGS

PART 1 - GENERAL

1.1 SUMMARY:

- A. Work of this section includes waterproof elastomeric coatings for concrete unit masonry.
- B. Related work specified elsewhere:
 - 1. Sheet metal flashing and trim.
 - 2. Joint sealants.
 - 3. Painting and coating.
 - 4. Concrete unit masonry.

1.2 SUBMITTALS:

- A. Product data: Submit manufacturer's instructions for installation of elastomeric material over substrates indicated. Include detailed requirements for preparation of surfaces, application rates and methods, treatment of joints and protection requirements.
- B. Samples: Submit two sets of color and texture samples from coating manufacturer for selections by Architect.

1.3 QUALITY ASSURANCE:

- A. Applicable standards:
 - 1. Standards of ASTM International (ASTM) as referenced herein.
- B. Wind driven rain resistance: Elastomeric coating system shall have passed Federal Test method TT-C-555B (98 mph) for wind driven rain.
- C. Mock-up:
 - 1. Prepare a minimum 100 sq. ft. mock-up of elastomeric coating system in area as directed by Architect, for Architect's review.
 - 2. Mock-up will be reviewed for color, texture, uniformity, appearance and workmanship. If mock-up is not satisfactory, prepare additional mock-ups until Architect's approval is obtained.
 - 3. Approved, undamaged mock-up may remain as part of the finished work and shall serve as a standard of quality for the remainder of the work.

1.4 DELIVERY, STORAGE AND HANDLING:

- A. Delivery:
 - 1. Deliver materials to project site ready-mixed in original containers with labels intact.
 - 2. Provide labels bearing manufacturer's name, coating type, color and recommended installation procedures.
- B. Storage and handling:
 - 1. Store materials in location acceptable to Architect.
 - 2. Maintain neat, clean conditions in storage area; remove rags and waste materials at end of each day's work.
 - 3. Close containers not in use. Leave no materials open.

1.5 PROJECT/SITE CONDITIONS:

- A. Environmental requirements:
 - 1. Comply with manufacturer's recommendations for environmental conditions under which materials may be applied and cured.
 - 2. Apply no materials when subject to windblown dust or rain.
 - 3. Apply no materials on wet surfaces or where temperature of substrate would result in excessive, rapid drying causing streaks or discoloration.
- B. Apply coating to substrate which indicates acceptable moisture level when tested by a moisture meter.
- C. Perform pH testing to determine alkalinity of substrates prior to coating application; comply with manufacturer's product data.

1.6 WARRANTY:

- A. Provide a five-year watertightness warranty, executed jointly by material manufacturer and applicator.
 - 1. Warranty shall provide for repair or replacement of defective materials and workmanship, including leakage, during the warranty period.
 - 2. Warranty shall include repair of minor hairline cracking of substrate resulting from thermal movement and nominal building shrinkage and settlement up to a maximum crack width of 1/64".
 - 3. Warranty shall begin at Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ACRYLIC ELASTOMERIC COATING:

- A. Smooth acrylic elastomeric coating:
 - 1. Acceptable products; subject to compliance with specified criteria:
 - a. BASF Building Systems, MasterProtect EL 750.
 - b. Momentive Performance Materials, Inc., Last-O-Coat Elastomeric Waterproof Coating VIP8100.
 - c. Pittsburgh Paints Pitt-Flex 4-110 Smooth Elastomeric Coating.
 - d. TNEMEC, Enviro-Crete 156 Smooth.
 - 2. Characteristics:
 - a. Composition: Water-borne, single-component, acrylic polymer, waterproofing-decorative coating system.
 - b. Elongation: 330% minimum at break when tested in accord with ASTM D2370-98(2010).
 - c. Moisture vapor permeability: Minimum 2.0 perms, maximum 13 perms, when tested in accord with ASTM D1653-13.
 - d. Dry film thickness: Minimum 10 mils, pinhole-free.
 - e. Texture: Smooth.
 - f. Color: As selected by Architect from manufacturer's full range.
- B. Primers, fillers and sealers: As recommended by system manufacturer's product data. Include block filler over unit masonry surfaces.

PART 3 - EXECUTION

3.1 PREPARATION OF SURFACES:

- A. Surfaces to receive coating shall be dry and free of oils, dirt, dust, grease, mildew, fungus, frost, efflorescence, laitance, peeling coating, chalking coating and other loose, foreign or deleterious materials.
 - 1. Verify that cracks and damage to substrate surfaces have been repaired and sealed prior to coating application.
 - 2. Verify that sealant work around wall penetrations and joints has been completed prior to coating application.
- B. Stucco and concrete:
 - 1. Surfaces shall be dry prior to applying first coat.
 - 2. Fill cracks and small holes with prime coat or sealant in accord with manufacturer's product data. Prime other areas as recommended by coating manufacturer.
- C. Concrete unit masonry: Rub to remove loose mortar and debris. Fill irregularities with cement grout.
- D. Metals: Clean and prime in accord with product data.
- E. Prior to application of elastomeric coating system, expansion and control joints shall be caulked as specified in Joint Sealants section and metal flashings shall be installed and caulked.
- F. Mask penetrations and adjacent surfaces to prevent coating adhesion to these surfaces.
- G. Mask caulked joints to prevent application of coating to sealant, including caulked joints of reglet counterflashing system. Do not allow masking to cover substrate beyond edge of sealant.

3.2 APPLICATION:

- A. Prime surfaces, and if necessary, apply block filler as directed by manufacturer's product data. Allow primer to dry before applying coating.
- B. Treat minor hairline cracks using manufacturer's buttering grade sealant material applied in 1/16" thickness over cracks and troweled flush with substrate or feathered at a distance of 2" either side of crack.
- C. Apply elastomeric coating in manner and number of applications to achieve minimum dry film thickness of 10 mils, pinhole-free.
- D. Apply coating materials in accord with manufacturer's product data.
 - 1. Apply materials only when moisture content of surfaces is within manufacturer's recommended limits.
 - 2. Apply materials using clean brushes, rollers or spraying equipment.
 - 3. Apply elastomeric coating in a fan pattern to achieve uniform thickness. Finish each stroke in same direction so that texture is uniform throughout expanse of installation.
 - 4. Comply with manufacturer's product data for drying time between coats.
- E. Apply coating to exterior concrete masonry units.

- F. Finish coats shall be pinhole-free, free of brush marks, streaks, laps or pile-up of paint, skipped or missed areas.
- G. Make edges of coating adjoining other materials clean and sharp without overlapping.
- H. Remove masking before coating sets, leaving smooth edges and no uncoated substrate.

3.3 CLEANING:

- A. Leave finished work area in a neat condition with no evidence of overspray on adjacent surfaces or property. Clean-up spills and overspray immediately with soap and water.

End of Section

SECTION 07 5420

PVC MECHANICALLY ATTACHED ROOFING

PART 1 - GENERAL

1.1 SUMMARY:

- A. Work described in this section includes application of mechanically attached roof membrane system over insulated steel deck, and over Tectum deck and related elastomeric or coated metal flashings.
- B. Related work specified elsewhere:
 - 1. Rough carpentry.
 - 2. Sheet metal flashing and trim.
 - 3. Metal roof deck.

1.2 SUBMITTALS:

- A. Product data:
 - 1. Submit a complete listing of each particular component or element of the roof membrane system that is required, specified or proposed for use on this project.
 - a. Identify each component or element proposed for use by product number, name, and pertinent characteristics.
 - b. Identify each component or element by indicating the function or location of each within the assembly.
 - 2. Submit product description and complete installation instructions, including standard flashing details, for insulation, roofing and accessory materials. Indicate specific systems and procedures proposed for use, deleting inapplicable data. Indicate fastener types and spacings, including mechanical fasteners for insulation attachment to meet specified wind uplift requirements.
- B. Shop drawings:
 - 1. Submit plans, drawings, and details illustrating the following:
 - a. Roof plan indicating fastening patterns, layout of each layer, relative elevations and slopes.
 - b. Drain locations and layout.
 - c. Edge flashing conditions.
 - d. Typical major penetrations.
 - e. Dimensionally located expansion joints and area dividers.
 - f. Typical flashing details.
 - g. Flashing details not specifically indicated on drawings or in manufacturer's product data and details.
 - h. Walkway pad layouts.
 - i. All other pertinent data required for this project.
 - 2. Submit for tapered insulation from roof system manufacturer's authorized tapered fabricator. Indicate layout of insulation showing slopes, crickets, valleys and drain locations. Include longitudinal and transverse sections, and sections showing insulation layers. Indicate method of attachment.
- C. Intent to warrant and certifications: Submit an Intent to Warrant executed by authorized representative of roof membrane system manufacturer, indicating that manufacturer has reviewed drawings and specifications, conditions affecting the work and the relationship of roof membrane system with related work, and that manufacturer proposes to provide warranty as specified herein without further stipulation.

1. Submit certification that proposed applicator is approved for warranted work by roof membrane system manufacturer.
 2. Submit certification from authorized representative of roof membrane system manufacturer stating that specified system and materials, as well as indicated surfaces and conditions, are acceptable for purpose of providing specified warranty.
- D. Field reports: Submit manufacturer's certified field reports as herein specified.
- E. Submittals schedule: Obtain Architect's approval of submittals prior to pre-roofing conference.
- F. Research/evaluation reports: For components of roofing system, from ICC-ES.

1.3 QUALITY ASSURANCE:

- A. Qualifications of applicator: Applicator shall be an approved roofing contractor authorized or certified to install roofing systems which can be warranted by the roofing materials manufacturer. Applicator shall be one who can furnish certification from the roofing manufacturer certifying that the applicator has satisfactorily applied the type of roof specified on projects which have been completed for at least five years.
- B. Applicable standards:
1. ASTM International (ASTM), standards as referenced herein.
 2. National Roofing Contractors Association (NRCA): "The NRCA Roofing Manual: Membrane Roof Systems-2011".
 3. Underwriters Laboratories, Inc. (UL):
 - a. Building Materials Directory, 2014 Edition.
 - b. Fire Resistance Directory, 2014 Edition.
- C. Design criteria:
1. Wind uplift resistance: Comply with wind uplift requirements of International Building Code, 2006 Edition with Georgia Amendments.
 2. Fire resistance: Comply with fire resistance designs indicated on drawings. Use only manufacturers and type of materials as required by indicated designs.
- D. Fastener testing:
1. Prior to roof system installation, perform a minimum of two pullout tests for each 100 squares of roofing to be installed; minimum and maximum number of pulls shall be as further required by roof membrane manufacturer, dependent upon roof size. Use same fasteners, methods and techniques as proposed for project installation.
 2. Perform 60% of the tests in perimeter and perimeter corner areas, and perform 40% in field of roof.
 3. Pullout strength shall meet or exceed values required for specified wind uplift resistance. If pull-out does not meet uplift resistance criteria, obtain corrective recommendations from insulation and membrane manufacturers. Re-test using new fasteners and using the same number and locations as specified for initial tests.
 4. Submit complete copies of pullout test reports to Architect and Owner.
- E. Pre-roofing conference: Prior to beginning roofing work, a pre-roofing conference will be held to review work to be accomplished.
1. Contractor, Architect, roofing subcontractor, roof membrane system manufacturer's representative and subcontractors who have equipment penetrating roof or whose work involves access to roof shall be present.

2. Contractor shall notify all parties at least seven days prior to time for conference.
3. Contractor shall record minutes of meeting and distribute to attending parties.

1.4 DELIVERY, STORAGE AND HANDLING:

- A. Deliver materials to site in manufacturer's unopened containers bearing manufacturer's name and type of material.
- B. Store materials in dry, covered storage, off ground. Handle roll goods to prevent damage to edges. Protect materials from exposure to spark or flame and extended periods at temperatures above 90°F.
- C. Store cartons level, standing in upright position. Do not stack cartons. Protect open top containers from debris and precipitation.
- D. Store solvent-bearing materials in dry, cool storage. Keep lids tight on opened containers to prevent solvent escape.

1.5 PROJECT/SITE CONDITIONS:

- A. Apply roof membrane system in dry weather when temperature is 40°F. or above. Undertake application only when forecasted weather conditions are in accord with requirements of membrane manufacturer's product data.
- B. Protection:
 1. Protect building from damage and defacing by roofing operations.
 2. Restore or replace adjacent work or materials damaged during handling of roofing materials.
 3. Provide protection or avoid traffic on completed roof surfaces.
- C. Surfaces to receive roof membrane system shall be clean, smooth, free of voids or projections, grease, oil, contaminants and foreign material. Commence application only after surfaces are in proper condition to receive roof membrane system.
- D. Ascertain that the work of other trades penetrating roof membrane system or intended to be made watertight by membrane application is in place and accepted prior to installation of roof system. Schedule roofing application to minimize traffic on membrane.

1.6 WARRANTIES:

- A. Roof membrane material warranty: Provide manufacturer's standard 15-year warranty for roof membrane material against manufacturing defects, including wind-related damage to 74 mph and factory-made seams.
- B. Manufacturer's full system warranty: Furnish manufacturer's 15-year comprehensive watertight warranty covering roofing, insulation, accessories and related flashings. Warranty shall include labor and materials to correct defects without limit.
- C. Warranties shall begin at Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ROOF MEMBRANE SYSTEM:

- A. Acceptable products; subject to compliance with specified requirements:
 - 1. Johns Manville, UltraGard PVC.
 - a. Membrane system: SR-50 Mechanically Fastened Roofing Membrane System.
 - b. Flashing materials: Same material as roof membrane or roof manufacturer's standard PVC-coated, minimum 24 gauge galvanized steel.
 - 2. Sika Sarnafil Inc., Sarnafil.
 - a. Membrane system: S327 Mechanically Attached Roofing Membrane System.
 - b. Flashing materials: Same material as roof membrane or roof manufacturer's standard PVC-coated, minimum 24 gauge galvanized steel.
- B. Characteristics:
 - 1. Membrane material: 0.045" minimum thickness, polyester reinforced Polyvinyl Chloride (PVC) sheet meeting ASTM D4434-12, Type III.
 - 2. Elongation at break: 20% when tested in accord with ASTM D751-06(2011).
 - 3. Seam strength: Minimum 75% of tensile strength when tested in accord with ASTM D751-06(2011), A-Grab Method.
 - 4. Linear dimension change: Maximum 0.5% when tested in accord with ASTM D1204-14.
 - 5. Change in weight after immersion in water: Maximum 3% when tested in accord with ASTM D570-98(2010).
 - 6. Color: White or off-white.
- C. Prefabricated accessories: Provide manufacturer's premium quality walkway pads, prefabricated pipe boots, corners and other standard prefabricated elements.
- D. Sealants and adhesive:
 - 1. General: Sealants and adhesive materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.
 - 2. Liquid-type materials shall comply with VOC limits of authorities having jurisdiction.
- E. Insulation and membrane fastener systems; Type required by roofing system manufacturer's product data and meeting characteristics and wind uplift further specified:
 - 1. Corrosion resistance: Pass FM 4470 Corrosion Test, modified DIN 50018 standard, with a maximum of 15 percent red rust after 15 wet and dry acidic atmosphere cycles in Kesternich cabinet.
 - 2. Plates: Non-corrosive material.

2.2 ROOF INSULATION:

- A. Isocyanurate roof insulation:
 - 1. Type: Rigid isocyanurate closed-cell foam boards, permanently bonded to glass fiber reinforced cellulosic felt facing sheets, complying with requirements of ASTM C1289-14a, Type II, Class I, Grade 2.
 - 2. Face size: Minimum 4'-0" by 4'-0", as required by manufacturer's product data.

3. Total thickness: 1.5".
 4. Long-term thermal resistance (LTTR) R-value in accord with ASTM C1289-14a: R-8.6 for total thickness.
- B. Perlite insulation for tapered units, crickets:
1. Type: Rigid perlite boards.
 2. Face size: Minimum 2'-0" by 4'-0".
 3. Thickness: 1", except as otherwise required to achieve roof slopes indicated.
 4. "R" value at 75°F.: Minimum 2.78/inch.
 5. Roof covering classification: UL Classified for installation with Class A roof covering.
 6. Slope for tapered boards: 1/4" per foot, across board width.

2.3 ACCESSORY MATERIALS:

- A. Cant strips, tapered edge strips and blocking: Pressure-preservative treated lumber as specified in Rough Carpentry section. Creosote and oil/aliphatic preservatives are not allowed.
- B. Pourable filler for pitch pockets: In accord with roof system manufacturer's product data.
- C. Compressible insulation for non-wall-supported decks and expansion joints:
1. Material: 2.25 pcf density, unfaced fiberglass.
 2. Thickness: As required to fill space between wood blocking and parapet; compressed 30 percent.
 3. R value at 75°F.: 4.35.
- D. Flexible liner for non-wall-supported decks and expansion joints:
1. Acceptable manufacturers:
 - a. BMCA Insulation Products, Inc., Lexsuco Roofing Control Joint.
 - b. Nervestral, Inc.
 - c. BASF Building Systems.
 2. Characteristics:
 - a. Type: Non-reinforced, homogeneous vinyl sheet.
 - b. Thickness: 20 mils.
 - c. Tensile strength: 1800 psi in accord with ASTM D412-06a(2013).
 - d. Elongation: Maximum 250 percent in accord with ASTM D412-06a(2013).
 - e. Substrate and joint adhesives: Flexible liner manufacturer's adhesives recommended for use with flexible liner material.
- E. Roof drains:
1. Acceptable products: Premium type in accord with roof membrane manufacturer's product data; suitable for specified roof warranty and approved in writing by roof membrane manufacturer. Refer to Division 23, Heating Ventilating and Air Conditioning and Division 22, Plumbing.
 2. Accessories: Provide strainer, adhesive, sealant, flashings and accessories as required for a complete, watertight installation.
- F. Gypsum board coverboard: Meeting ASTM C1396-14a, Type X, minimum 1/2" thickness; moisture- and fire-resistant gypsum board.
- G. Adhesive for insulation adhesion to deck and for adhesion of second insulation layer: Roof membrane and insulation manufacturer's recommended product.

- H. Mechanical fasteners for insulation: Mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Immediately prior to application of roof membrane system, sweep roof deck, removing debris and foreign material.
- B. Non-wall-supported decks: Install in accord with NRCA Detail SP-7.
 - 1. Install curb vertically, attached to roof deck only.
 - 2. Drape flexible liner into expansion joint cavity a minimum of 11". Bring flexible liner up and over face of vertical curb; fasten to curb at minimum 8" o.c. Seal laps in flexible liner in accord with manufacturer's product data.
 - 3. Install compressible insulation vertically into draped flexible liner, between wood curb and parapet wall. Top edge of insulation shall be flush with top of curb.
 - 4. Install expansion joint cover as specified in Sheet Metal Flashing and Trim section.
- C. Expansion joints: Install curbs in accord with NRCA Detail SP-8.
 - 1. Install curbs vertically, attached to roof deck only.
 - 2. Drape flexible liner into expansion joint cavity a minimum of 11". Bring flexible liner up and over faces of vertical curbs; fasten to curbs at minimum 8" o.c. Seal laps in flexible liner in accord with manufacturer's product data.
 - 3. Install compressible insulation vertically into draped flexible liner, between wood curbs. Top edge of insulation shall be flush with top of curbs.
 - 4. Install expansion joint cover as specified in Sheet Metal Flashing and Trim section.
- D. Gypsum board underlayment for metal decks: Install gypsum board loose laid over metal decking in accord with UL and code requirements. Stagger end joints one-half board length. Bear edges on deck ribs.

3.2 RIGID INSULATION INSTALLATION:

- A. Install insulation in two layers, with joints staggered between layers. Stagger end joints in adjacent boards. Butt edges for snug contact.
- B. Installation over metal decks: Install insulation in accord with manufacturer's product data. Install using specified mechanical fasteners. Attach first layer of insulation to metal deck using specified mechanical fasteners, meeting building code required wind uplift resistance. Bear edges of board on deck ribs.
- C. Installation over Tectum decks: Mechanically fasten insulation. Install each layer of insulation to deck using mechanical fasteners designed and sized for fastening specified board-type roof insulation to Tectum roof decks.
- D. Solid-mop second and subsequent layers of insulation, including tapered insulation and crickets, in solid cold adhesive mopping at rate recommended by insulation manufacturer. Step into place to ensure full adhesion; do not slide into place.

- E. Install only as much roof insulation each work period as can be covered by roofing by end of same work period.
- F. Mechanically anchor cant strips and tapered edge strips to wood blocking, in accord with roof manufacturer's product data. Butt lengths together and to adjacent construction. Install cant strips at abutting vertical surfaces, except those which have built-in cants.
- G. "Shave" insulation at roof drains to obtain slope to drains.

3.3 ROOF MEMBRANE SYSTEM INSTALLATION:

- A. Install roof membrane system, mechanically attached, in accord with manufacturer's product data. Secure with screw and disc fasteners meeting requirements of pullout testing at spacings recommended by product data.
- B. Lay out roof membrane sheets with seams located in accord with approved shop drawings. Lap sheets 5" minimum and heat weld laps using roof membrane system manufacturer's required heat welding procedures. If required by roof membrane manufacturer's product data, seal exposed edges with edge sealant at each lap.
- C. Mechanically attach roof membrane at perimeter, terminations and penetrations in accord with manufacturer's product data and approved shop drawings.
- D. Install base flashing in accord with manufacturer's product data and approved shop drawings using same material as roof membrane. Lap joints and seal. Fully adhere flashing membrane to substrates; wrap top of flashing membrane over parapet walls and down face 2" minimum; cover with metal flashing as specified in Sheet Metal Flashing and Trim section. Where flashing top edge does not return over parapet wall, cover top edge of flashings with metal termination bars and counterflashing.
- E. Flash at curbs and similar vertical surfaces same as base flashings. Provide cant strips at curbs and equipment not having integral curbs. Provide metal counterflashing at curbs which are not self-flashing.
- F. Install gravel stops, fascias and copings in accord with membrane manufacturer's product data, approved shop drawings, details and Sheet Metal Flashing and Trim section.
- G. Pitch pockets: Comply with membrane manufacturer's product data and approved shop drawings and details for pitch pocket flashing.
 - 1. Form from roof membrane manufacturer's membrane-clad metal, with flat locked joints. Pitch pocket shall be at least 3" larger on each side than penetration; 4" high with round corner flanges extending 3" onto roof surface.
 - 2. Provide nailers for pitch pocket attachment, secured to deck.
 - 3. Flash flashing sheet onto roof surface at least 3" beyond metal and seal to membrane. Adhere to vertical metal surfaces and lap inside pitch pocket.
 - 4. Fill pocket to within 1" of top with cement grout, then complete filling with pourable filler in accord with manufacturer's product data, to achieve bond between pourable filler and flashing sheet.

- H. Roof drain flashing: Comply with membrane manufacturer's product data and approved shop drawings and details for roof drain flashing.
 - 1. Cut hole in membrane at roof drain locations, smaller than drain clamping ring.
 - 2. Install water cutoff mastic to seal between membrane and drain.
 - 3. Lock membrane under drain clamping ring. Tighten bolts.

- I. Plumbing vent penetrations: Comply with membrane manufacturer's product data, details, approved shop drawings and NRCA Detail SP-18, for pipe penetration flashing.
 - 1. Flash using prefabricated flashing boots.
 - 2. At top of flashing provide stainless steel drawband. Finish exposed edges with lap sealant.

- J. Install roof walkway pads where indicated on roof plan at locations as approved by Architect to connect and surround roof-top equipment and roof access locations. Heat weld to roof membrane and position pads with edges spaced as recommended by membrane manufacturer.

- K. Remove trash, tools, debris and extraneous materials from roof areas during the course of work and upon completion of roof installation.

- L. At end of each day's work, provide water cutoff at exposed edges of roof membrane.

- M. Upon completion of the roof membrane system installation, an inspection shall be made by a representative of the roof membrane system manufacturer to ascertain that the roof membrane system has been installed according to manufacturer's published product data, specifications and details.
 - 1. Defects or deviations from manufacturer's product data and approved shop drawings shall be remedied as required to secure manufacturer's warranty.
 - 2. Reinspect installation until defects and deviations are corrected.
 - 3. Provide written report of each inspection, documenting defects, deviations and corrective measures.
 - 4. After corrections have been approved, include statement in final report that roof is installed correctly and is suitable for specified warranty.
 - 5. Submit one copy of each report to Architect immediately following each inspection.

- N. Completed roof system shall be free of defects, including leaks and ponded water. No ponding water shall remain within 48 hours of measurable precipitation.

End of Section

SECTION 07 6200

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY:

- A. Work of this section includes:
 - 1. Formed roof-drainage sheet metal fabrications.
 - 2. Formed low-slope roof sheet metal fabrications.
 - 3. Formed wall sheet metal fabrications.
 - 4. Manufactured reglets with counterflashing.
- B. Related work specified elsewhere:
 - 1. Roofing system.
 - 2. Joint sealants.
 - 3. Flexible flashing.

1.2 PERFORMANCE REQUIREMENTS:

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet metal standard for flashing and trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Thermal movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature change: 120 deg F, ambient; 180 deg F, material surfaces.

1.3 SUBMITTALS:

- A. Shop drawings: Indicate material types, sizes, shapes, thicknesses, finishes, fabrication details, anchors, connections, expansion joints and relation to adjacent work. Details and profiles shall be drawn at full scale.
- B. Product data: Indicate product description, finishes and installation instructions for manufactured products, including interface with adjacent materials and surfaces.
- C. Samples; submit as follows:
 - 1. Special finishes: 6" by 6" samples for Architect's color selection.
- D. Submittals schedule: Obtain Architect's acceptance of submittals prior to pre-roofing conference.

1.4 QUALITY ASSURANCE:

- A. Applicable standards as referenced herein:
 - 1. Aluminum Association (AA), "Aluminum Sheet Metal Work in Building Construction".
 - 2. American Architectural Manufacturers Association (AAMA).
 - 3. American National Standard Institute/Single Ply Roofing Institute (ANSI/SPRI), as referenced herein.
 - 4. ASTM International (ASTM).
 - 5. National Roofing Contractors Association (NRCA): "The NRCA Roofing Manual: Membrane Roof Systems-2011".
 - 6. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), "Architectural Sheet Metal Manual," Seventh Edition - January, 2012.
 - 7. Society for Protective Coatings (SSPC), standards as referenced herein.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Store materials off ground, under cover. Protect from damage and deterioration.
- B. Handle materials to prevent damage to surfaces, edges and ends of sheet metal items. Damaged material shall be rejected and removed from site.

1.6 WARRANTIES:

- A. Warrant sheet metal flashing and trim work to be free of defects in materials and workmanship. Warranty period shall be two years beginning at Date of Substantial Completion. Combine warranty with roofing warranty.
- B. Finish warranty: Warrant fluoropolymer coating to remain free of checking, crazing, peeling, chalking or fading for a period of twenty years, beginning at Date of Substantial Completion.
- C. Warranty periods shall begin at Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS:

- A. Aluminum: 3003-H14 alloy, meeting ASTM B209-14.
 - 1. Gutters,: Material thickness shall meet SMACNA Manual Table 1-5 requirements, minimum 0.040" thickness, fluoropolymer finish.
 - 3. Downspouts: Material thickness shall meet SMACNA Manual Table 1-9 requirements, minimum 0.032" thickness, finish to match gutters.
 - 4. Gutter brackets: Material thickness shall meet SMACNA Manual Table 1-8 size requirements, minimum 1/4" thickness by 1" wide, finish to match gutters.
 - 5. Downspout hangers: 0.051" thickness, finish to match downspouts.
 - 6. Splash pans: 0.063" thickness, mill finish.
 - 7. Miscellaneous sheet metal flashing and trim: 0.032" thickness, mill finish.
- B. Roofing cement/mastic: As recommended by roof membrane manufacturer.
- C. Fasteners: Stainless steel.
 - 1. Nails: Flat head, needle point, not less than 12 ga. and of sufficient length to penetrate substrate 1" minimum.
 - 2. Expansion shields: Lead or bronze sleeves.

3. Screws: Self-tapping type, with round heads.
 4. Bolts: Furnished complete with nuts and washers.
 5. Rivets: Round head, solid type.
 6. Blind clips and cleats: Same gauge as sheet metal.
- D. Silicone sealant for concealed joints:
1. Acceptable products:
 - a. Dow Corning Corp., #795.
 - b. Pecora Corp., #895.
 - c. Tremco, Inc., an RPM Company, SpecTrem 2.
 2. Type: One-part silicone rubber; meeting ASTM C920-14a, Type S, Grade NS, Class 25.
- E. Bituminous paint: Cold-applied asphalt emulsion for separation of dissimilar materials: Complying with ASTM D1187-97(2011), minimum 30 mils thickness.

2.2 FINISHES:

- A. Fluoropolymer coating finish:
1. Two coat, shop-applied, baked-on fluoropolymer coating system based on minimum 70% Arkema Group, Kynar 500 or Solvay Solexis, Inc., Hylar 5000 resin (Polyvinylidene fluoride, PVDF), formulated by a licensed manufacturer and applied by manufacturer's approved applicator to meet AAMA 2605-05.
 2. Color: as selected by Architect from manufacturer's full range.
 3. Finish on unexposed surfaces: Mill finish.
 4. Work to receive fluoropolymer coating includes sheet metal flashing and trim exposed to view from building elevations.

2.3 SHEET METAL FABRICATION:

- A. Fabricate sheet metal work in accord with approved shop drawings and applicable standards. Form sheet metal work with clear, sharp and uniform arrises. Hem exposed edges. Form curved components to radius indicated on the drawings, without deformation in metal.
- B. In aluminum sheets less than 0.040" thick, make joints using flatlock seams, 3/4" in width. Fill seams with exterior sealant. Make joints in thicker sheets using seaming or by Tungsten Arc Welding (TIG) or Gas Metal Arc Welding (MIG) processes, using appropriate filler alloy.
- C. Provide linear sheet metal items in 10'-0" to 12'-0" sections, except as otherwise noted. Form flashing using single pieces for the full width. Provide shop-fabricated, one-piece corners and transition pieces, with maximum 2'-0" long legs.
- D. Make riveted joints using solid shank rivets or pop rivets as applicable. Pop rivets shall be closed end type.
- E. SMACNA Manual fabrication requirements:
1. Gutters: Figure 1-2, Style A. Size gutters in accord with Tables 1-1, 1-2, 1-3 and 1-4, and Charts 1-1 and 1-2.
 2. Downspouts: Figure 1-32B. Size downspouts in accord with Tables 1-1, 1-2, 1-3 and 1-4, and Charts 1-1 and 1-2.

PART 3 - EXECUTION

3.1 SHEET METAL INSTALLATION:

- A. Install work in accord with approved shop drawings and applicable standards. Sheet metal items shall be true to line, without buckling, creasing, warp or wind in finished surfaces.
- B. Coordinate flashing at roof surfaces with roofing work to provide weathertight condition at roof terminations.
- C. Perform field joining of lengths as specified for shop fabrication.
- D. Isolate dissimilar materials to prevent electrolysis. Separate using bituminous paint.
- E. Seaming: Form seams in direction of flow. Aluminum seams shall be filled with exterior sealant. Lap seams occurring in members sloping 45° or more than 4", minimum; bed in flashing cement.
- F. Secure sheet metal items using continuous cleats, clips and fasteners as indicated. Perform no exposed face fastening.
- G. Fastening:
 - 1. Nails: Confine to one edge only of flashing 1'-0" or less in width. Space nails at 4" o. c., maximum. Provide neoprene washers for nails.
 - 2. Cleats: Continuous, formed to profile of item being secured.
 - 3. Clips: Minimum 2" wide by 3" long, formed to profile of item being secured. Space at 2'-0" o. c., maximum.
- H. Joints:
 - 1. Form joints in linear sheet metal to allow for 1/2" minimum expansion at 12'-0" o. c., maximum, and maximum 2'-0" from corners.
 - 2. Form plates to profile of sheet metal item.
 - 3. Install 1'-0" wide backup plate centered under joint. Set sheet metal over backup plate in two beads of specified silicone sealant, 1/4" in diameter, minimum.
 - 4. For units with top width of 12" and wider, install 6" cover plate centered over joint. Set in two beads of specified silicone sealant, 1/4" in diameter, minimum.
 - 5. Mate components for positive seal. Do not allow sealant to migrate onto exposed surfaces.
- I. Where sheet metal is indicated as flashing above and below heads of doors, windows and other penetrations, extend flashing minimum 8" beyond opening, each side. Turn ends up minimum 2" to form end dams and to ensure drainage through weeps and not into cavity.
- J. Install perimeter metal cap flashing in 10'-0" lengths with backup plates at joints.
 - 1. Secure perimeter metal cap flashing in ** saw cut ** reglet ** with lead wedges installed at 2'-0" o. c., maximum. Hammer wedges to a depth which will not interfere with sealant or backer rod. Place wedge at each length so that wedges are within 8" of joint, without interfering with splice plates.
 - 2. Install sealant in accord with Joint Sealants section, to form fillet bead minimizing holding of water.

3. Construct with riveted and seal joints, lapped 1", minimum, in direction of flow. Provide 3/4" minimum expansion joints at 30'-0" o. c., maximum. Form expansion joints in accord with SMACNA Manual, Figure 1-7, butt type.
4. Hang gutters with high points equidistant from downspouts, evenly sloped toward downspouts. Support gutters in accord with SMACNA Manual, Figure 1-16 for heavy gutters at low-slope roofs.
5. Secure downspouts to exterior walls at 6'-0" o. c., maximum, using straps and expansion type fasteners in accord with SMACNA Manual, Figure 1-35C. Lap downspout joints 1-1/2", minimum, and seal.
6. Where downspouts empty onto lower roof surfaces, provide splash pan in accord with SMACNA Manual, Figure 1-36; secure splash pan in adhesive, prior to spreading roof aggregate.

End of Section

SECTION 07 6500
FLEXIBLE FLASHING

PART 1 - GENERAL

1.1 SUMMARY:

- A. Work of this section includes flexible through-wall flashing.
- B. Related work:
 - 1. Air barrier.
 - 2. Concrete.
 - 3. Masonry
 - 4. Cold-formed metal framing.
 - 5. Joint sealants.
 - 6. Door frames.
 - 7. Aluminum framing systems.

1.2 SUBMITTALS:

- A. Product data: Submit manufacturer's product data including membrane and accessory material types, composition, descriptions and properties, installation instructions and substrate preparation recommendations.
- B. Shop drawings: Indicate locations and extent of flexible flashing, including details of typical conditions, intersections with other building elements and materials.
- C. Samples:
 - 1. Submit 1'-0" by 1'-0" samples of flexible flashing material.
 - 2. Submit 1'-0" length of termination bar.

1.3 QUALITY ASSURANCE:

- A. Applicable standards: ASTM International (ASTM), standards as referenced herein.

PART 2 - PRODUCTS

2.1 SELF-ADHERING FLEXIBLE MEMBRANE FLASHING:

- A. Acceptable products, subject to compliance with specified requirements:
 - 1. Carlisle SynTec, Inc., CCW-705-TWF.
 - 2. Fortifiber Building Products Systems Group, FortiFlash.
 - 3. Grace Construction Products, Perm-A-Barrier Wall Flashing.
 - 4. W.R. Meadows, Inc., Sealtight Air-Shield.
- B. Characteristics:
 - 1. Type: Adhesive-backed rubberized asphalt compound, bonded to 8 mil, high density, cross-laminated polyethylene film. Adhesive side coated with release paper.
 - 2. Membrane thickness: Minimum 40 mils.
 - 3. Surface conditioner/primer and mastic/sealant: Membrane manufacturer's standard components. Surface conditioner/primer shall be formulated to provide tenacious bond with substrates, including those coated with dampproofing or asphaltic materials.

- C. Stainless steel pan flashing: Minimum 24 ga., AISI Type 302/304 or 316 alloy, 2B finish. Provide stainless steel anchors and fasteners.
- D. Termination bar for top edge of flexible flashing:
 - 1. Minimum 24 ga. by 1" wide continuous termination bar, unless otherwise shown on the drawings.
 - 2. Material for termination bars shall be Type 302/304 or 316 stainless steel.
 - 3. Provide termination bars predrilled for anchors to match spacing of cold-formed metal framing; maximum spacing of 16" o.c.
 - 4. Fasteners and anchors shall be self-drilling stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION OF SELF-ADHERING MEMBRANE FLASHING:

- A. Stainless steel pan flashing receptor: Install continuous stainless steel flashing backup as shown on the drawings.
 - 1. Start stainless steel at projected drip edge at outside face of masonry. Extend through cavity, rising not less than 2".
 - 2. Form joints in stainless steel flashing by using 4" minimum flat laps between adjacent flashing pieces, with full continuous bed of silicone sealant in lap. Tool/scrape away excess sealant.
 - 3. Bed stainless steel flashing to steel shelf angles in full, troweled-on bed of silicone sealant. Tool/scrape away excess sealant.
- B. Install flashing in accord with manufacturer's product data and as specified herein to prevent moisture from entering wall or to redirect it exterior.
- C. Install flashing at exterior door heads, window heads and sills, other wall openings, lintels, shelf angles and at weep hole locations, continuous, in same bed joint as weep hole.
- D. Prime substrates to receive membrane flashing using specified primers, and complying with membrane manufacturer's instructions. Primed substrates shall allow full bond of adhesive side of membrane to substrates. Should full bond at top edge not be immediately evident, mechanically attach a 1" wide, continuous, hot-dipped galvanized steel termination bar at top edge of flashing, against backup substrate, fastened at 2'-0" o.c. maximum.
- E. At masonry backup:
 - 1. At double wythe masonry walls, install self-adhering membrane flashing starting 1" in from outside face of exterior wythe, extend through cavity, rising minimum 6" above top of mortar net, and terminate minimum 1" above mortar joint of interior wythe, in accord with membrane manufacturer's details. Seal top edge with continuous bead of mastic.
 - 2. At concrete walls, install self-adhering membrane flashing starting 1" in from outside face of exterior wythe, extend through cavity, rising minimum 6" above top of mortar net. Terminate against substrate, in accord with membrane manufacturer's details. Seal top edge with continuous bead of mastic.
 - 3. Set in continuous 1-1/2" wide bed of adhesive, and mechanically fasten to substrates.
 - 4. Overlap flashing 2" and roll overlaps with a steel hand roller. Apply a bead of mastic/sealant along top edge, seams and cuts of flashing in accord with product data.
 - 5. Top flashing with full bed of fresh mortar as masonry is continued.

- F. At stud walls with masonry veneer:
 - 1. Install flashing starting 1" in from outside face of exterior wythe, extend through cavity, rising not less than 8" above weeps and minimum 6" above mortar net, where mortar net is present. Terminate flashing against sheathing.
 - 2. Set in continuous 1-1/2" wide bed of adhesive, and mechanically fasten to each framing stud.
 - 3. Coordinate flashing installation with application of air barrier to ensure air barrier membrane covers upper edge of flashing.
 - 4. Overlap flashing 2" and roll overlaps with a steel hand roller. Apply a bead of mastic/sealant along top edge, seams and cuts of flashing in accord with product data.
 - 5. Top flashing with full bed of fresh mortar as masonry is continued.
- G. Extend flashing minimum 8" beyond openings, each side. Turn ends up minimum 2" to form enddams and to ensure drainage through weeps and not into cavity.
- H. Install in maximum lengths to avoid joints. Fold corners without cutting. Apply a detail coat of liquid mastic over the folds.
- I. Adhere flashing to shelf angle. Provide adhesive cant to force water to exterior.
- J. Termination bar: Install continuous stainless steel termination bar at flashing top termination edges, at flashing terminations at expansion and control joints, and where shown on the drawings. Mechanically fasten to each stud, and mechanically fasten at 16" o.c. at CMU walls and concrete walls.
 - 1. Anchor termination bar using stainless steel anchors and fasteners.
 - 2. Apply silicone sealant at top edge of termination bars.
- K. Ensure that membrane flashing is provided with operable weeps spaced and located as specified in Brick Masonry section. Weeps shall be above finished grade. For flashing at roofing or back of parapet wall conditions, place lowest flashing joints and weeps in joint just above reglets or termination of top edge of roof base flashing.

End of Section

SECTION 07 7112

MANUFACTURED COPINGS AND FASCIAS

PART 1 - GENERAL

1.1 SUMMARY:

- A. Related work specified elsewhere:
 - 1. Roofing system.
 - 2. Sheet metal flashing and trim.
 - 3. Joint sealants.

1.2 DESIGN REQUIREMENTS:

- A. Copings and fascias shall be designed and installed for wind loads in accord with building code requirements and tested for resistance in accord with ANSI/SPRI ES-1, using basic wind speed from building code.

1.3 SUBMITTALS:

- A. Shop drawings: Indicate material types, sizes, shapes, thicknesses, finishes, fabrication details, anchors, connections, expansion joints and relation to adjacent work. Details and profiles shall be drawn at full scale.
- B. Product data: Indicate product description, finishes and installation instructions for manufactured products, including interface with adjacent materials and surfaces.
- C. Samples; submit as follows:
 - 1. Special finishes: 6" by 6" samples for Architect's color selection.
 - 2. Manufactured copings: 1'-0" length in style and finish specified.
- D. Submittals schedule: Obtain Architect's acceptance of submittals prior to pre-roofing conference.
- E. Certifications:
 - 1. Submit manufacturer's written certification that copings and fascias comply with requirements of ANSI/SPRI ES-1.
 - 2. Roof membrane system manufacturer's written certification that coping and fascia are suitable for specified roof system warranty.
 - 3. Submit written certification that fluoropolymer coating complies with specified performance requirements.

1.4 QUALITY ASSURANCE:

- A. Applicable standards:
 - 1. American National Standard Institute/ Single Ply Roofing Institute (ANSI/SPRI), as referenced herein.
 - 2. ASTM International (ASTM), as referenced herein.
 - 3. National Roofing Contractors Association (NRCA): "The NRCA Roofing Manual: Membrane Roof Systems-2011".
 - 4. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), "Architectural Sheet Metal Manual," Seventh Edition - January, 2012.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Store materials off ground, under cover. Protect from damage and deterioration.
- B. Handle materials to prevent damage to surfaces, edges and ends of sheet metal items. Damaged material shall be rejected and removed from site.

1.6 WARRANTIES:

- A. Coping and fascia warranty:
 - 1. Warrant materials to be free of defects in material and workmanship for five years. If, after inspection, manufacturer agrees that materials are defective, manufacturer shall, at their option, repair or replace them.
 - 2. 20-Year Performance Warranty: Manufacturer shall warrant that roof edge system, when installed per manufacturer's instructions, will not blow off, leak, or cause membrane failure, in wind conditions up to 110 mph, or manufacturer shall replace or repair their materials.
- B. Finish warranty: Warrant fluoropolymer coating to remain free of checking, crazing, peeling, chalking or fading for a period of twenty years.
- C. Warranty periods shall begin at Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FORMED ALUMINUM COPINGS:

- A. Acceptable products:
 - 1. W. P. Hickman Co., Permasnap Plus.
 - 2. Innovative Metals Company, Inc. (IMETCO), PerformaEdge Coping.
 - 3. Metal-Era, Inc., Perma-Tite Coping.
 - 4. National Sheet Metal Systems, Inc., Snap-On Coping System. 0
- B. Characteristics:
 - 1. Material: Formed aluminum alloy, smooth surface. Minimum thickness as follows:
 - a. Up to 4" face: Use 0.040".
 - b. From 4" to 8" face: Use 0.050".
 - c. From 8" to 10" face: Use 0.063".
 - d. Over 10" face: Use 0.080".
 - 2. Finish: Fluoropolymer coating, as specified herein.
 - 3. Face height: As indicated on drawings.
 - 4. Lengths: 10'-0" minimum.
 - 5. Joints: Splice plates, concealed, in accord with manufacturer's product data.
- C. Accessories:
 - 1. Splice plates: 0.050" thickness aluminum sheet, 6" minimum width, for concealed installation. Finish shall match copings.
 - 2. Anchor plate: Hot dip galvanized steel of manufacturer's standard design.
 - 3. Prefabricated sections: Factory-assembled, mitered, welded corners, to match copings in design and finish.

2.2 FORMED ALUMINUM FASCIAS:

- A. Fascias shall be approved by roof membrane system manufacturer as suitable for specified roof system warranty.

- B. Acceptable products:
 - 1. W. P. Hickman Co., Econosnap.
 - 2. Metal-Era, Inc., System 200.
 - 3. Innovative Metals Company, Inc. (IMETCO), PerformaEdge Fascia.
 - 4. National Sheet Metal Systems, Inc., Fascia System Type 1.

- C. Characteristics:
 - 1. Fascia cover material: Aluminum alloy, smooth surface.
 - a. Minimum thickness as follows:
 - 1) Up to 4" face: Use 0.040".
 - 2) From 4" to 8" face: Use 0.050".
 - 3) From 8" to 10" face: Use 0.063".
 - 4) over 10" face: Use 0.080".
 - 2. Fascia finish: Fluoropolymer coating, as specified herein.
 - 3. Fascia height: As indicated on drawings.
 - 4. Cant material: Minimum 24 ga. hot dip galvanized steel, of manufacturer's standard design.
 - 5. Lengths: 10'-0" minimum.
 - 6. Joints: Splice plates, concealed, in accord with manufacturer's product data.

- D. Accessories:
 - 1. Splice plates: 0.050" thickness aluminum sheet, 6" minimum width, for concealed installation. Finish shall match fascia.
 - 2. Prefabricated sections: Factory-assembled, mitered, welded corners, to match fascia in design and finish.

2.3 FINISH:

- A. Fluoropolymer coating finish:
 - 1. Two coat, shop-applied, baked-on, fluoropolymer coating system based on minimum 70% Arkema Group, Kynar 500 or Solvay Solexis, Inc., Hylar 5000 resin (Polyvinylidene fluoride, PVDF), formulated by a licensed manufacturer and applied by manufacturer's approved applicator to meet AAMA 2605-05.
 - 2. Color: Color as selected by Architect from manufacturer's full range.
 - 3. Finish on unexposed surfaces: Mill finish.

2.4 WATERPROOF MEMBRANE SUBFLASHING:

- A. Acceptable products; subject to compliance with specified requirements:
 - 1. Carlisle Coatings and Waterproofing, Inc., WIP 300HT.
 - 2. Polyguard Products, Inc., Polyguard Deck Guard HT.
 - 3. Grace Construction Products, Grace Ice & Water Shield HT (High-Temperature)

- B. Characteristics:
 - 1. Type: Self-adhering rubberized asphalt sheet complying with ASTM D1970-15.
 - 2. Thickness: Minimum 40 mils when tested in accord with ASTM D3767-03(2014), method A.
 - 3. Tensile strength: 250 psi minimum when tested in accord with ASTM D412-06a(2013).
 - 4. Elongation: 250% when tested in accord with ASTM D412-06a(2013), Die C Modified.
 - 5. Provide primers, sealants and accessories required for a waterproof installation.

PART 3 - EXECUTION

3.1 PREFABRICATED COPING INSTALLATION:

- A. Install prefabricated copings in accord with manufacturer's product data and ANSI/SPRI ES-1, true to line.
- B. Where roof membrane does not occur under copings, install waterproof membrane subflashing under copings, secure membrane subflashing under backup plates and continuous cleats.
 - 1. Install membrane subflashing fully adhered to substrates in accord with manufacturer's product data, except where more stringent requirements are specified herein.
 - 2. If required, prime surfaces to receive membrane materials. Allow primer to dry until tack-free. Prime only area which can be covered with sheet membrane during work period. Reprime surfaces which are not covered within 24 hours of primer application.
 - 3. Install membrane materials with side and end laps recommended by product data. Begin installation at low points, lapping succeeding sheets to shed water.
 - 4. Membrane applications shall be fully adhered, smooth, straight and free of blisters, buckles, fishmouths and wrinkles affecting the complete adherence of the membrane. Patch and repair defective work in accord with manufacturer's product data. Areas which exhibit defective areas or generally poor or improper workmanship shall be removed and replaced.
 - 5. Double membrane at changes in plane by application of a centered membrane strip. Cover strip completely with full width sheet.
 - 6. Seal around protrusions and at terminations in accord with product data.
 - 7. Repair punctures and tears in membrane by patching with membrane material.
- C. Install anchor plate at 5'-0" o. c. maximum under copings. Install concealed splice plates at intersections in accord with manufacturer's product data.
- D. Install copings over anchor plates and splice plates, with minimum 3/8" wide joints over splice plate intersections. Set copings over splice plates in full bed of sealant or extruded butyl tape, 1/2" from intersection edges.
- E. Make weathertight fit, allowing for expansion and contraction as recommended by manufacturer's product data.
- F. Attach materials using aluminum or stainless steel fasteners. Exposed fasteners shall match metal in finish.

3.2 PREFABRICATED FASCIA INSTALLATION:

- A. Install prefabricated fascias in accord with manufacturer's product data and ANSI/SPRI ES-1, true to line.
- B. Install retainers continuous, leaving 1/2" gap between sections for expansion; fasten at each predrilled slot. Install sealants, gaskets and concealed splice plates in accord with manufacturer's product data.
- C. Install fascia covers over cant dams and splice plates, with minimum 3/8" wide joints over splice plate intersections. Set fascia covers over splice plates in full bed of silicone sealant or extruded butyl tape, 1/2" from intersection edges. Mechanically fasten back edges at 1'-0" o. c. maximum.

- D. Make weathertight fit, allowing for expansion and contraction as recommended by manufacturer's product data.
- E. Attach materials using aluminum or stainless steel fasteners. Exposed fasteners shall match metal in finish.

End of Section

SECTION 07 8400

FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY:

- A. Related work:
 - 1. Concrete.
 - 2. Mortar and grout.
 - 3. Brick masonry.
 - 4. Concrete unit masonry.
 - 5. Structural steel.
 - 6. Metal decking.
 - 7. Metal fabrications.
 - 8. Rough carpentry.
 - 9. Thermal insulation.
 - 10. Fireproofing.
 - 11. Joint sealants.
 - 12. Gypsum board.
 - 13. Fire protection specialties.
 - 14. Mechanical.
 - 15. Plumbing.
 - 16. Electrical.

1.2 SYSTEM PERFORMANCE REQUIREMENTS:

- A. Penetration firestopping: Penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
 - 1. Penetrations in fire-resistance-rated walls: Determine penetration firestopping ratings in accord with ASTM E814-13a or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - a. F-rating: Not less than the fire-resistance rating of constructions penetrated.
 - 2. Penetrations in horizontal assemblies: Determine penetration firestopping ratings in accord with ASTM E814-13a or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - a. F-rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
 - b. T-rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
 - 3. Exposed penetration firestopping: Products shall have flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84-13a.
 - 4. Penetrations in smoke barriers: Determine penetration firestopping ratings in accord with UL 1479.
 - a. L-rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.

- B. Fire-resistive joint systems: Where required, fire-resistive joint systems shall resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
 - 1. Joints in or between fire-resistance-rated construction: Determine fire-resistive ratings by ASTM E1966-14a or UL 2079. Rating shall be equal to or exceed fire-resistance rating of construction they will join.
 - 2. Exposed fire-resistive joint systems: Products shall have flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84-15.
 - 3. Joints in smoke barriers: Determine fire-resistive joint system ratings in accord with UL 2079.
 - a. L-rating shall not exceed 5.0 cfm/ft of joint at 0.30 inch wg at both ambient and elevated temperatures.
- C. Firestop systems using cementitious fill materials shall not be permitted.
- D. Where there is no specific third party tested and classified firestop system available for a particular firestop configurations, obtain from firestop manufacturer, an Engineering Judgement (EJ) or Equivalent Fire Resistance Rated Assembly (EFFRA).
- E. Systems shall be free of asbestos and volatile organic compounds (VOCs).
- F. Systems shall be free of volatile solvents, noxious fumes and strong odors.

1.3 SUBMITTALS:

- A. Shop drawings: Submit detailed drawings of each type and size penetration through fire-rated construction, indicating materials, dimensions, assembly construction and rating. Indicate through-penetration firestop system design listings, including illustrations from a qualified testing and inspection agency for each type penetration.
- B. Product data: Submit product data and installation instructions for each type of installation. Include installation details and test reports indicating that firestopping materials, systems and devices meet specified requirements and design criteria. Indicate Classification marking of qualified testing and inspection agency.
- C. Certifications:
 - 1. Submit written certification that firestop materials are asbestos free and that materials comply with local regulations.
 - 2. Submit written certification that firestop materials comply with local regulations controlling use of volatile organic compounds (VOC's) and are non-toxic to building occupants.

1.4 QUALITY ASSURANCE:

- A. Applicable standards; standards of the following, as referenced herein:
 - 1. ASTM International (ASTM).
 - 2. Factory Mutual Research (FMR).
 - 3. National Fire Protection Association (NFPA).
 - 4. Underwriters Laboratories, Inc. (UL).

- B. Fire-test-response characteristics: Provide firestopping system design listing by a testing and inspection agency in accord with the specified UL standards.
- C. Acceptable installer shall comply with one or more of the following:
 - 1. A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."
 - 2. Licensed by state or local authority, where applicable.
 - 3. Successfully completed not less than 5 comparable scale projects.
- D. Single source responsibility: Obtain firestop systems for each kind of penetration and construction condition indicated from a single primary firestop systems manufacturer.
 - 1. Materials from different manufacturer than allowed by tested and listed system shall not be intermixed in the same firestop system or opening.
 - 2. Install tested and listed firestop systems before installing an Engineering Judgement or Equivalent Fire Resistance Rated Assembly (EFFRA).
- E. Pre-installation meeting: Prior to beginning firestopping work, a pre-installation meeting shall be held to review work to be accomplished.
 - 1. Contractor, Architect, firestopping system manufacturers' representatives, installer and other subcontractors whose work involves firestopping shall be present.
 - 2. Contractor shall notify all parties at least seven days prior to time for meeting.
 - 3. Contractor shall record minutes of meeting and distribute to attending parties.
- F. Mock-ups:
 - 1. Install one of each type firestopping assembly for review by Architect prior to commencement of firestopping work. Notify Architect at least 36 hours in advance for observation of mock-up installations, including check for objectionable or noxious fumes or odors. Should mock-ups be unacceptable, prepare additional mock-ups until acceptable to Architect.
 - 2. Following Architect's review, identify and preserve mock-ups as a standard of quality for remaining firestopping work. Acceptable mock-ups may remain as part of the finished work.

1.5 DELIVERY STORAGE AND HANDLING:

- A. Deliver firestopping materials in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer.
- B. Store and handle firestopping materials in accord with manufacturer's product data.

1.6 JOB CONDITIONS:

- A. Coordinate firestopping installation with other work requiring penetrations through fire-resistive construction. Install penetrating elements prior to installation of firestopping systems or devices.
- B. Secure inspection and approval of firestopping work by building officials prior to concealment.
- C. Support penetrating elements independently of firestopping systems or devices.

- D. Do not cover up firestopping installations until Owner's inspection agency or Authorities Having Jurisdiction have examined each installation.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL:

- A. Penetration firestopping systems, devices and sealants shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Sealant shall have a VOC content of 250 g/L or less.

2.2 THROUGH-PENETRATION FIRESTOP SYSTEMS:

- A. Acceptable manufacturers; subject to compliance with specified requirements:
 - 1. Hilti USA.
 - 2. 3M Fire Protection Products.
 - 3. Nelson Firestop Products.
 - 4. The RectorSeal Corp.
 - 5. Specified Technologies, Inc. (STI).
 - 6. Tremco, Inc.
- B. System description: Field-constructed firestopping for penetrations through walls and floors composed of specified materials and accessories assembled in accord with Through-Penetration Firestopping System Numbers, listed in UL Building Materials Directory, current Edition, and tested in accord with ASTM E814-13a.
- C. Materials: UL Classified for use in through-penetration firestop systems.
 - 1. Firestop sealant: Single-component, elastomeric silicone or endothermic latex sealant compound; self-adhering, flexible and watertight; non-sag and self-leveling types as required.
 - 2. Firestop foam: Two-part, room temperature vulcanizing, silicone elastomer, non-combustible foam void seal.
 - 3. Intumescent sealants and putties: Single-component, synthetic, organic/inorganic intumescent elastomers.
 - 4. Intumescent wrap strips: One-part, organic/inorganic, intumescent elastomeric sheet; aluminum foil-faced one side.
 - 5. Intumescent composite sheets: Composite sheets composed of organic/inorganic intumescent elastomeric core bonded on one side to 28 ga. galvanized steel sheet and other side reinforced with steel wire mesh, covered with aluminum foil.
 - 6. Mineral wool or ceramic fiber safing: Non-combustible fiber tested in accord with ASTM E136-12, with melting point in excess of 2000 degrees F.; flame spread of 15 maximum and 0 smoke development when tested in accord with ASTM E84-15. Thickness and density shall be as required by Through-Penetration Firestop System designs.
- D. Accessories:
 - 1. Primers, adhesives and backer rods: As required by manufacturer's product data and system designs.
 - 2. Forming, damming and packing materials: Types as indicated in Through-Penetration Firestop Systems.
 - 3. Restricting collars: Manufacturer's standard design as required for firestop system.

4. Fasteners, anchor clips, sleeves, clamps, spacers, ties, cover plates and miscellaneous accessories: Provide as required by manufacturer's product data and in accord with Through-Penetration Firestop System designs.

2.3 THROUGH-PENETRATION FIRESTOP DEVICES:

- A. Acceptable manufacturers; subject to compliance with specified requirements:
 1. Hilti USA.
 2. Isolatek International, Inc.
 3. Nelson Firestop Products.
 4. ProSet Systems, Inc.
 5. The RectorSeal Corp.
 6. Specified Technologies, Inc. (STI).
 7. Tremco, Inc.
- B. Types: Factory-assembled, self-contained firestopping devices for penetrations through walls and floors; UL Classified for Through-Penetration Firestop Devices as listed in UL Building Materials Directory, current Edition, and tested in accord with ASTM E814-13a.
- C. Accessories: Provide sealants, adhesives, fasteners, sleeves, clamps, spacers, anchor clips, ties and accessories in accord with manufacturer's product data and as required for complete installation.

2.4 FIRESTOP SEALANTS:

- A. Acceptable products; subject to compliance with specified requirements:
 1. Hilti USA, CP 601S Firestop Sealant.
 2. Nelson Firestop Products, CLK.
 3. 3M Fire Protection Products, Fire Barrier Silicone Sealant 2000 N/S.
 4. The RectorSeal Corp., FlameSafe FS 4000 Silicone Sealant.
 5. The RectorSeal Corp., Metacaulk 835+.
 6. Specified Technologies, Inc. (STI), SpecSeal Pen 300 Silicone Joint Sealant.
 7. Tremco, Inc., Fyre-Sil.
- B. Characteristics: Single-component, self-adhering, flexible, watertight, elastomeric silicone sealant compound; UL Classified. Provide self-leveling type for horizontal applications, non-sag type for all other applications.

2.5 SAFING:

- A. Acceptable products; subject to compliance with specified requirements:
 1. Thermal Ceramics, Cerablanket F.S.
 2. Thermafiber Inc., Thermafiber Safing Insulation.
- B. Characteristics:
 1. Material: Semi-rigid mineral fiber insulation, meeting ASTM C665-15, Type 1.
 2. Density: 4.0 pcf.
 3. Thickness: As required to meet specified requirements.
 4. Facing: Unfaced or reinforced foil facing, based on UL Design selected.
 5. Fire resistance properties:
 - a. Melting point: Minimum of 2000°F. when tested in accord with ASTM C24-09(2013).
 - b. Non-combustible: As defined by ASTM E136-12 and NFPA.

- c. Fire hazard characteristics: Maximum flame spread of 15 and smoke development of 5 when tested in accord with ASTM E84-15 (unfaced).

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine areas to receive firestopping materials prior to beginning work. Verify that opening areas and dimensions for penetrations to receive firestopping systems and devices do not exceed design requirements.
- B. Remove projections interfering with installation. Prepare surfaces in accord with manufacturer's product data and UL Through-Penetration Firestop Devices Numbers.

3.2 PREPARATION:

- A. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond. Do not allow spillage and migration onto exposed surfaces.
- B. Masking tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of the Work. Remove tape as soon as it is possible to do so without disturbing the firestopping seal with substrates.

3.3 INSTALLATION:

- A. General:
 - 1. Comply with manufacturer's product data and UL Classified for Through-Penetration Firestop Devices Numbers.
 - 2. Install firestopping materials fitted to adjacent construction to fill voids.
 - 3. Firestop penetrations through fire-rated walls, partitions, floors and floor/ceiling assemblies with tested assemblies in accord with UL 1479 or with a through-penetration firestop system or device when tested in accord with ASTM E814-13a.
 - 4. Firestopping shall comply with code requirements.
- B. Fire and smoke barrier identification:
 - 1. Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other rated wall required to have protected openings shall be effectively and permanently identified with signs or stenciling in a manner acceptable to the Authority having Jurisdiction.
 - 2. Such identification shall be:
 - a. Located in accessible concealed floor, floor-ceiling or attic spaces.
 - b. Located within 15'-0" of the end of each wall and at intervals not exceeding 30'-0" measured horizontally long the wall or partition.
 - c. Include lettering not less than 3" in height with a minimum 3/8" stroke in a contrasting color
 - 3. Suggested wording for fire and smoke barriers: "_____ HOUR FIRE AND SMOKE BARRIER – PROTECT ALL OPENINGS."

- C. Through-penetration firestop systems and devices:
 - 1. Install at penetrations through fire-rated floor and wall construction, including partitions and floor/ceiling assemblies, in accord with manufacturer's product data and UL System Numbers. Provide materials and accessories as required.
 - 2. Install intumescent type firestop systems where plastic piping, cable, conduit and other combustible items, including insulated metal pipes, penetrate fire-rated construction.
 - 3. At Contractor's option, through-penetration firestop devices of similar function may be installed in lieu of firestop systems.
 - 4. Do not remove forming materials unless specified in system designs.
- D. Firestop sealant: Seal perimeters, voids and joints of fire-rated walls and partitions, including abutment of floor and roof or ceiling structure, and flutes of metal decking.
 - 1. If required by UL Design, install mineral wool or ceramic fiber in cavities, packed full and tight with allowance for sealant installation.
 - 2. Seal both faces of walls and partitions with firestop sealant. Tool sealant flush with adjacent finish.
 - 3. In accord with UL Fire Resistance Directory Designs, packed concrete and masonry joints shall be sealed using firestop sealant or using sealant as specified in Joint Sealants section.
- E. Mineral fiber safing:
 - 1. Install safing in cavities of penetrations through non-rated floor and wall construction, including spaces around piping, conduits, cables and duct penetrations.
 - 2. Install safing in voids and joints of non-rated walls and partitions abutting metal decking of floor and roof structures. Pack flutes of metal decking solid with safing material.
 - 3. Safing shall be installed at joints and penetrations in non-rated construction not exposed to view and concealed in finish work. Secure safing by compressing into voids or joints and using manufacturer's standard clips or closure plates as required.
- F. Seal voids and joints of non-rated walls and partitions abutting concrete floor and roof construction using sealant as specified in other sections.

3.4 FIELD QUALITY CONTROL:

- A. Inspection: Independent inspection agency employed and paid by Owner, will examine penetration firestopping in accord with ASTM E2174-14b and ASTM E2393-10a. Inspection agency will examine firestopping and will determine, in general, that firestopping has been installed in compliance with tested and listed firestop system, and that installation process conforms to UL Qualified Firestop Contractor Program.
- B. Inspector will advise contractor of deficiencies noted within one working day.
- C. Do not proceed to enclose firestopping with other construction until inspection agency has verified firestop installation complies with requirements of Contract Documents.
- D. Where deficiencies are found, repair or replace firestopping so that it complies with requirements of tested and listed system design.

3.5 CLEANING:

- A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses. Use methods and cleaning materials approved by manufacturers of firestopping products and or assemblies in which openings and joints occur.
- B. Protect firestopping during and after curing period from contact with contaminating substances.

End of Section

SECTION 07 9200

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY:

- A. Related work specified elsewhere:
 - 1. Window framing internal sealants.
 - 2. Glazing sealants.
 - 3. Roofing and flashing sealants.
 - 4. Firestopping.

- B. Definitions:
 - 1. Joint sealant:
 - a. A weatherproof elastomer used in filling and sealing joints, having properties of adhesion, cohesion, extensibility under tension, compressibility and recovery; designed to make joints air and watertight.
 - b. Material is designed generally for application in exterior joints and for joints subject to movement.
 - 2. Joint sealant compound:
 - a. A material used in filling joints and seams, having properties of adhesion and cohesion; not required to have extensibility and recovery properties.
 - b. Material is designed generally for application in interior joints not subject to movement.
 - 3. Caulk: The process of filling joints, without regard to type of material.
 - 4. Joint failure: A caulked joint exhibiting one or more of the following characteristics:
 - a. Air and/or water leakage.
 - b. Migration and/or reversion.
 - c. Loss of adhesion.
 - d. Loss of cohesion.
 - e. Failure to cure.
 - f. Discoloration.
 - g. Staining of adjacent work.
 - h. Development of bubbles, air pockets or voids.

1.2 SUBMITTALS:

- A. Product data: Submit manufacturer's product description, indicating conformance with specified requirements and installation instructions for each type of sealant. Indicate preparation and priming requirements for each substrate condition.

- B. Color samples:
 - 1. Samples for initial selection: Samples shall be actual materials or literature depicting actual colors of standard color materials showing full range of colors available for each product exposed to view.
 - 2. Samples for verification: For each kind and color of joint sealant required, provide samples with joint sealants in 1/2" wide joints formed between two 6" long strips of material matching appearance of exposed surfaces adjacent to joint sealants.

- C. Adhesion compatibility test results: Submit a letter from sealant manufacturer indicating adhesion and compatibility testing has been performed and that materials are compatible and that adhesion is acceptable. Indicate requirements for primers or special preparation.
- D. Joint sealant schedule: Include the following information:
 - 1. Joint sealant applications, joint locations, and designations.
 - 2. Joint sealant manufacturers and product names.
 - 3. Joint sealant formulations.
 - 4. Joint sealant colors.

1.3 QUALITY ASSURANCE:

- A. Applicable standards as referenced herein:
 - 1. ASTM International (ASTM).
- B. Adhesion compatibility tests: Perform tests on actual samples of aluminum framing system components, to determine that materials are compatible and that adhesion is acceptable. Identify requirements for primers or special preparation.
 - 1. Test structural sealants in accord with ASTM C1135-00(2011).
- C. VOC content of interior sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Architectural sealants: 250 g/L.
 - 2. Sealant primers for nonporous substrates: 250 g/L.
 - 3. Sealant primers for porous substrates: 775 g/L.
- D. Architect reserves the right to reject work not in conformance with selected colors, based upon verification samples.
- E. Mock-up:
 - 1. Prepare, caulk and finish one mock-up sample of each joint condition.
 - 2. Sample joints shall be approved by Architect prior to beginning work. Approved, undamaged mock-up joints shall serve as a standard of quality for the remainder of the work.

1.4 PROJECT/SITE CONDITIONS:

- A. Weather conditions:
 - 1. Install no materials under adverse weather conditions or when temperatures are below or above those recommended by manufacturer's product data or when substrate moisture content is above manufacturer's recommended level.
 - 2. Proceed with work only when forecasted weather conditions are favorable for joint cure and development of high early bond strength.
 - 3. Wherever joint width is affected by ambient temperature variations, install materials only when temperatures are in lower third of manufacturer's recommended installation temperature range.
- B. Protection of adjacent surfaces:
 - 1. Protect by applying masking material or manipulating application equipment to keep materials in joint. If masking materials are used, allow no tape to touch cleaned surfaces to receive sealant. Remove tape immediately after sealant application, before surface skin begins to form.
 - 2. Remove misapplied materials from surfaces by using solvents and methods recommended by manufacturer.

3. At surfaces from which materials have been removed, restore to original condition and appearance.

1.5 WARRANTIES:

- A. Installer's warranty: Warrant work to be watertight and free from defects in materials and workmanship, including joint failure, for a period of five years.
- B. Exterior silicone sealant material warranty: Warrant exterior silicone sealants to be free from defects in materials and to provide structural adhesion, watertight weatherseal and non-staining of adjacent materials for a period of twenty years.
- C. Warranties shall begin at Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL:

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC content: Sealants and sealant primers shall comply with the following:
 1. Architectural sealants shall have a VOC content of 250 g/L or less.
 2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
 3. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.

2.2 SILICONE SEALANTS:

- A. Low modulus silicone sealant:
 1. Acceptable products; subject to compliance with specified requirements:
 - a. Dow Corning Corp., #790.
 - b. Momentive Performance Materials, Inc., GE Silpruf LM SCS2700.
 - c. Pecora Corp., #890NST.
 - d. Tremco, Inc., an RPM Company, SpecTrem 1.
 2. Type: One-part, low modulus silicone rubber; meeting ASTM C920-14a, Type S, Grade NS, Class 50, for use NT.
 3. Colors: As selected by Architect from manufacturer's full range.
- B. Medium modulus silicone sealant:
 1. Acceptable products; subject to compliance with specified requirements:
 - a. Dow Corning Corp., #795.
 - b. Momentive Performance Materials, Inc., GE Silpruf SCS2000.
 - c. Pecora Corp., #895NST.
 - d. Tremco, Inc., an RPM Company, SpecTrem 2.
 2. Type: One-part silicone rubber; meeting ASTM C920-14a, Type S, Grade NS, Class 50, for use NT.
 3. Colors: As selected by Architect from manufacturer's full range.

2.3 TWO-PART POLYURETHANE SEALANT FOR HORIZONTAL TRAFFIC-BEARING PAVEMENTS:

- A. Acceptable products:
 1. BASF Building Systems, MasterSeal SL 2.
 2. Pecora Corp., Urexpan NR-200.

3. Tremco, Inc., an RPM Company, 45 SSL.

B. Characteristics:

1. Type: Two-component polyurethane sealant for horizontal traffic-bearing surfaces meeting ASTM C920-14a, Type M, Grade P or NS, minimum Class 25, for use T; self-leveling for flat surfaces and non-sag for sloped surfaces.
2. Colors: As selected by Architect from manufacturer's full range.

2.4 SILICONE BATH SEALANT FOR WET AREAS:

A. Acceptable products:

1. Dow Corning Corp., 786 Mildew-Resistant Silicone Sealant.
2. Franklin International, Titebond Kitchen & Bath Sealant.
3. Momentive Performance Materials, Inc., GE Sanitary SCS1700.
4. Pecora Corp., #898NST Silicone Sanitary Sealant.

B. Characteristics:

1. Type: One-part silicone rubber, mildew- and stain-resistant, acid-curing silicone sealant; meeting ASTM C920-14a, Type S, Grade NS, Class 25, for use NT.
2. Colors: As selected by Architect from manufacturer's full range.

2.5 SOLVENT-RELEASE-CURING ACRYLIC SEALANT:

A. Acceptable products:

1. Franklin International, Titebond Painters Plus Caulk.
2. Schnee-Morehead, Inc., Acryl-R Acrylic Sealant.
3. Tremco, Inc., an RPM Company, Mono 555.

B. Characteristics:

1. Type: One-part, acrylic polymer sealant, meeting ASTM C1311-14.
2. Colors: As selected by Architect from manufacturer's full range.

2.6 PAINTABLE ACRYLIC-LATEX JOINT SEALANT:

A. Acceptable products:

1. Bostik, Chem-Calk 600.
2. Franklin International, Titebond Painters Caulk.
3. Momentive Performance Materials, Inc., GE RCS20.
4. Pecora Corp., AC-20 Acrylic Latex.
5. Tremco, Inc., an RPM Company, Tremflex 834.

B. Characteristics: Flexible, paintable, non-staining, non-bleeding acrylic latex or siliconized acrylic emulsion, meeting ASTM C834-14, Type OP, Grade NF.

2.7 ACCESSORY MATERIALS:

A. Joint cleaner: Type recommended by material manufacturer for substrates indicated.

B. Joint primer/sealer: Type recommended by material manufacturer for substrates, conditions and exposures indicated.

C. Bond breaker tape: Plastic tape applied to contact surfaces where bond to substrate or joint filler must be avoided for material performance.

- D. Sealant backer rod: Compressible rod stock as recommended by sealant manufacturer for compatibility with sealant. Provide size and shape of rod to control joint depth.
- E. Tooling agent: Agent recommended by material manufacturer to ensure contact of material with inner joint faces.

PART 3 - EXECUTION

3.1 JOINT SURFACE PREPARATION:

- A. Clean joints of debris and projections including shims.
- B. Clean joint surfaces immediately before caulking joints. Remove dirt, insecure coatings, moisture and other substances which would interfere with bond.
- C. Etch concrete and masonry joint surfaces to remove excess alkalinity, unless material manufacturer's product data indicates that alkalinity does not interfere with bond and performance. Etch with 5% solution of muriatic acid; neutralize with dilute ammonia solution; rinse with clean water and allow to dry before caulking.
- D. Roughen joint surfaces of non-porous materials, unless material manufacturer's product data indicates equal bond strength as porous surfaces. Rub with fine abrasive cloth or wool to produce dull sheen.

3.2 APPLICATION:

- A. Comply with joint sealant material manufacturer's product data and ASTM C1193-13 except where more stringent requirements are specified.
- B. Prime joint surfaces where recommended by material manufacturer. Do not allow primer/sealer to spill or migrate onto adjacent surfaces.
- C. Install backer rod for joint sealant materials, except where recommended by material manufacturer to be omitted for application indicated.
 - 1. Place backer rod to maintain recommended sealant thickness and profile.
 - 2. Place rod at depth to provide sealant manufacturer's recommended sealant depth.
 - 3. Do not twist rod during installation.
 - 4. Place rod to minimize possibility of extrusion when joint is compressed.
 - 5. Install bond breaker tape in lieu of backer rod for shallow, closed joints and as recommended by manufacturer's product data.
- D. Employ installation techniques which will ensure that materials are deposited in uniform, continuous ribbons without gaps or air pockets, with complete wetting of joint bond surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form slight cove so that joint will not trap moisture and debris.
- E. Do not allow materials to overflow onto adjacent surfaces. Prevent staining of adjacent surfaces.
- F. Remove excess and misplaced materials as work progresses. Clean the adjoining surfaces to remove misplaced materials, without damage to adjacent surfaces or finishes.

- G. Interior joints: At interior joints and seams at abutting and adjacent materials, recess joint sealant 3/16" in joints wider than 1/4". At joints 1/4" or less in width, tool joint sealant flush.
- H. Tool joints of non-sag sealant to concave profile and smooth, uniform surface, flush with edges of substrate. Maintain sealant depth-to-width ratio in accord with manufacturer's product data.
- I. Cure joint sealants and joint sealant compounds in accord with manufacturer's product data to obtain high early bond strength, internal cohesive strength and surface durability. Protect uncured surfaces from contamination and physical damage.

3.3 JOINT SEALANT SCHEDULE:

- A. Exterior vertical expansion joints: Low modulus silicone sealant.
- B. Exterior and interior joints in masonry, including control joints: Low modulus silicone sealant.
- C. Joints between metal panels: Medium modulus silicone sealant.
- D. Exterior and interior joints at perimeter of aluminum framing systems: Medium modulus silicone sealant.
- E. Exterior and interior joints at perimeter of hollow metal framing: Medium modulus silicone sealant.
- F. Exterior joints between wall finish and conduit and pipe penetrations, base plates of light fixtures, signage supports, and other items applied to exterior wall surface: Medium modulus silicone sealant.
- G. Interior concealed bedding joints and thresholds: Acrylic sealant. Solvent-release-curing acrylic sealant.
- H. Tile expansion and control joint sealant: Refer to Tiling section.
- I. Firestopped joints: Firestop sealant as specified in Firestopping section.
- J. Typical interior joints and seams at abutting and adjacent materials except as specified herein: Paintable acrylic-latex joint sealant.
- K. Interior joints in conjunction with vanities, fixtures and tile finishes: Silicone bath sealant.

End of Section

SECTION 08 1113

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY:

- A. Related work specified elsewhere:
 - 1. Wood doors.
 - 2. Door hardware.
 - 3. Glazing.
 - 4. Painting and coating.

1.2 PERFORMANCE REQUIREMENTS:

- A. The following performance requirements apply to all doors specified herein.
- B. Physical endurance: Comply with performance level for specified level classification in accord with ANSI/SDI A250.8-2014 and ANSI/SDI A250.4-2011 for doors and hardware reinforcing, ANSI/SDI A250.4-2011 for doors, frames, frame anchors and hardware reinforcing.
- C. Finish: Comply with standard performance criteria of ANSI/SDI A250.10-2011 for primed steel surfaces.
- D. Fire-rated assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, and temperature-rise limits where required, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Smoke- and draft-control assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
 - 2. Fire-rated, borrowed-light assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.
- E. Thermal performance of exterior insulated doors: Minimum aged value of $U = 0.40$ ($R = 2.5$) or better, apparent thermal performance in accord with SDI-113-13.

1.3 SUBMITTALS:

- A. Shop drawings: Indicate door and frame elevations and sections, materials, gauges and finishes, fabrication and erection details, location of finish hardware by dimension and locations, details of openings and louvers, and fire-resistance ratings, and temperature-rise ratings, requirements.
- B. Samples: Submit as follows:
 - 1. Door: 1'-0" by 1'-0" corner section showing door construction.
 - 2. Welded frame: 1'-0" by 1'-0" head and jamb corner section showing welded corner construction.
 - 3. Anchors: One of each type.

- C. Product data:
 - 1. Indicate that hollow metal doors and frames comply with specified requirements, including performance criteria.
 - 2. Sustainable design submittals: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- D. Certification of label construction: For components exceeding Underwriters Laboratories Inc. (UL) tested size limitations, submit UL inspection certificate stating that component construction conforms to UL rating requirements.

1.4 QUALITY ASSURANCE:

- A. Applicable standards; standards of the following, as referenced herein:
 - 1. American National Standards Institute, Inc. (ANSI).
 - 2. ASTM International (ASTM).
 - 3. National Fire Protection Association (NFPA), National Fire Codes.
 - 4. Society for Protective Coatings (SSPC).
 - 5. Steel Door Institute (SDI).
 - 6. Underwriters Laboratories, Inc. (UL).
- B. Fabrication standard: Except for more stringent requirements specified, comply with ANSI/SDI A250.8-2014 including performance levels as referenced.
- C. Fire door assemblies:
 - 1. Door and frame assemblies in rated walls shall have been tested in accord with NFPA 252 or UL 10C; after 5 minutes into NFPA 252 test, neutral pressure shall have been established at 40" or less above sill.
 - 2. Door and frame assemblies in corridors and smoke barriers shall have a minimum fire rating of 20 minutes and shall have been tested in accord with NFPA 252 or UL 10C without hose stream test. Assemblies shall comply with UL 1784 for draft and smoke control test; leakage may not exceed 3.0 CFM per foot of door at 0.10" of water column.
- D. Labeling requirements:
 - 1. Fire-rated components shall bear factory-applied labels showing name of manufacturer, name of third-party inspection agency, fire-protection rating, and where required for doors in exit enclosures, maximum transmitted temperature end point.
 - 2. Smoke and draft doors complying with UL 1784 shall be labeled as a smoke and draft control door.
 - 3. Permanently attach label to hinge stile of each fire-rated and smoke and draft control door.
- E. Source limitations: Obtain hollow-metal work from single source from single manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Mark each hollow metal door and frame at top hinge and on outside of packaging with destination door mark indicated on door schedule.
- B. Deliver hollow metal doors and frames palletized, packaged or crated for protection during transit and site storage.
 - 1. Do not use nonvented plastic.
 - 2. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
 - 3. Provide additional protection to prevent damage to factory-finished units.

- C. Inspect work upon delivery for damage. Reject damaged items.
- D. Store materials under cover, on raised platforms.
 - 1. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4" high wood blocking. Provide minimum 1/4" space between each stacked door to permit air circulation.
 - 2. Protect from moisture but provide for cross ventilation. Remove units from wet packaging if wetting occurs.

PART 2 - PRODUCTS

2.1 MATERIAL:

- A. Steel:
 - 1. Interior doors and frames: Fabricate of cold-rolled steel sheet meeting ASTM A1008-13.
 - 2. Exterior doors and frames: Fabricate of commercial quality, hot dip galvanized or galvanized steel sheet meeting ASTM A924-14 and ASTM A653-13 Designation A60 or G60; wipe coat not acceptable.
- B. Finish: Prime painted steel surfaces shall comply with requirements for acceptance stated in ANSI/SDI A250.3-2007(R2011).
 - 1. Interior doors and frames: One coat of manufacturer's standard rust-inhibitive primer.
 - 2. Exterior doors and frames: One coat of manufacturer's standard rust-inhibitive primer after chemical treatment of galvanized surfaces for paint adhesion.
- C. Coating for inside of frames to be fully grouted in masonry and concrete construction: Factory or field applied epoxy undercoating:
 - 1. Tnemec Series 66 Hi-Build Epoxoline.
 - 2. Devco High Performance Coatings, Devran 224HS High Build Epoxy.
 - 3. PPG Aquapon High-Build Semi-Gloss Polyamide-Epoxy Coating 97-130 Series.

2.2 DOORS:

- A. Physical performance: Performance for each level shall be in accord with ANSI/SDI A250.4-2011.
- B. Door classification:
 - 1. Standard interior hollow metal doors (1-3/4" thickness): Level 2, Heavy-duty, 18 ga., Model 2 - Seamless.
 - 2. Label fire-resistive composite metal doors (1-3/4" thickness):
 - a. Level 2, Heavy-duty, 18 ga., Model 2 - Seamless.
 - b. For fire doors in exit enclosures, average temperature developed on unexposed side during fire-resistance testing shall not exceed 450°F. at end of 30 minutes in fire test.
 - 3. Exterior composite metal doors (1-3/4" thickness): Level 2, Heavy-duty, 18 ga. Model Model 2 - Seamless.

- C. Door construction:
1. Core:
 - a. Exterior doors: Polyurethane.
 - b. Interior doors: Steel-stiffened door cores. Provide minimum thickness 0.026", steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6" apart. Spot weld to face sheets no more than 5" o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
 - c. Fire door cores: Mineral board or as required to provide fire-protection and temperature-rise ratings indicated.
 2. Edge bevel: Vertical edges beveled 1/8" in 2"; double-acting doors rounded on 2-1/8" radius. Non-handed door blanks with filler plates are not acceptable.
 3. Top and bottom edges: Flush, welded, minimum 18 ga. steel. Provide weep holes in bottom edge of exterior doors.
 4. Door faces and edge seams:
 - a. Full flush: Form each door face from a single sheet of steel of thickness specified herein. There shall be no visible seams on surface of faces. A full height vertical seam is permitted on door edges.
 - b. Seamless: In addition to requirements of Full Flush doors, no visible seams shall be permitted along vertical edges. Use one of the following seam edge methods:
 - 1) Fill vertical seam edges and dress smooth.
 - 2) Intermediately weld seams, fill edges, and dress smooth.
 - 3) Continuously weld seams and dress smooth.
- D. Glass moldings and stops:
1. Where specified or scheduled, provide doors with hollow metal moldings to secure glazing by others in accordance with glass opening sizes shown on approved shop drawings.
 2. Weld fixed moldings to door on security side.
 3. Loose stops shall be not less than 20 gage, with mitered corner joints, secured to frame opening by cadmium- or zinc-coated countersunk screws at 1'-0" o.c. maximum.
 4. Design snap-in moldings with mitered corners and with a non-removable stop on security side after glass installation.

2.3 FRAMES:

- A. Frame construction including sidelights and borrowed lite frames:
1. Welded steel frames in masonry walls, fire-rated frames and frames over 7'-0" in height in drywall partitions:
 - a. Gage:
 - 1) Level 2: 18 gage.
 - 2) Level 3: 16 gage.
 - b. Full profile welded, with all joints, including face, returns, soffit, stops, and rabbets, arc welded, dressed and ground smooth; no mechanical interlocking allowed.
 - c. Provide welded frames with temporary spreaders during shipping, storage and erection. Spreaders shall span both rabbets of frame and be located at bottom and at middle of frame.

2. Transom bars and mullions: Shop fabricate from same material as door frames.
 - a. Setup arc welded, with all joints, including face, flange and throat, full welded, dressed and ground smooth; no mechanical interlocking allowed.
 - b. Fabricate in largest size sections allowed by shipping and installation restrictions. Field joints shall occur only as indicated on approved shop drawings.
 3. Machine door frames for hardware scheduled for installation on that frame. Filler plates installed at unused openings will not be acceptable. Provide blockouts behind frame for continuous hinges.
 4. Joints:
 - a. Dress welded joints and ground smooth, indistinguishable in completed work.
 - b. Make non-welded connections with tight fitting, closed joints.
 - c. Make joints with aligned faces and arrises.
 5. Inside of frames to be grouted in masonry and concrete construction shall receive protective coating as specified herein.
 6. Loose glazing stops:
 - a. Removable glazing stops shall be cold rolled steel, no less than 20 gage, butted at corner joints and secured to frame using cadmium or zinc plated #6 countersunk sheet metal screws at 1'-0" o.c. maximum.
 - b. Frame underneath glazing stops and inside of glazing stop shall be treated for maximum paint adhesion and shall receive factory spray-applied high-build epoxy coating specified herein, 4 to 6 mils dft., prior to installation in frame.
- B. Frame anchors:
1. Wall anchors for frame attachment to masonry construction: Adjustable, flat, minimum 18 gage corrugated or perforated, T-shaped steel anchors with leg not less than 2" wide by 10" long. Provide one anchor per jamb for each 2'-0" of height or fraction thereof. Anchors for fire-rated frames shall be labeled type.
 2. Wall anchors for frame attachment to drywall partitions: Manufacturer's standard minimum 18 gage adjustable type for attachment to studs. Provide one anchor per jamb for each 2'-0" of height or fraction thereof. Anchors for fire-rated frames shall be labeled type.
 3. Floor anchors: Provide frames, other than slip-on drywall type, with minimum 18 gage anchors for attachment to floor.
 - a. For wall conditions that do not allow for the use of a floor anchor, provide an additional jamb anchor.
 - b. Anchors for fire-rated frames shall be labeled type.
 4. In-place masonry or concrete: 3/8" countersunk, flat head, stove bolts in expansion shields, spaced 6" maximum from top and bottom of frame and at 2'-0" o. c., maximum, between. Anchors for fire-rated frames shall be labeled type.
 5. Head struts: For frames over 7'-0" high and not anchored to masonry or concrete construction, provide 1/4" by 2" steel struts spot welded to jambs, each side, extending to building structure. Attach to structure. For frames over 4'-0" in width, provide center strut at head.

2.4 ACCESSORIES:

- A. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4" beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

2.5 PREPARATION FOR HARDWARE AND ANCHORS:

- A. Reinforcement: Factory reinforce door and frame components for hardware installation in accord with ANSI/SDI A250.8-2014 and ANSI/SDI A250.6-03(R2009).
- B. Punch single leaf frames to receive three silencers; double leaf frames to receive two silencers per leaf, at head.
- C. Provide grout shields where frames in masonry walls are cut or drilled.
- D. Install hardware reinforcement and anchors without distortions or blemishes on exposed surfaces.

PART 3 - EXECUTION

3.1 FRAME INSTALLATION:

- A. General:
 - 1. Install hollow metal frames in accord with ANSI/SDI A250.8-2014, ANSI/SDI A250.11-2012, SDI-122-07, manufacturer's product data and approved shop drawings.
 - 2. Frames in masonry and concrete walls and fire-rated frames shall be tightly butted to walls. For other frames, clearance between frame and interfacing wall surfaces shall be 1/16" maximum.
 - 3. Shimming of door hinges is not an acceptable correction of door frames installed out of erection tolerance.
- B. Welded frames:
 - 1. Set welded frames in position prior to beginning partition work. Brace frames until permanent anchors are set.
 - 2. Set anchors for frames as work progresses. Install anchors at hinge and strike levels. Install rubber bumpers and silencers in frames prior to grouting.
 - 3. Grout frames in masonry walls as specified in Concrete Unit Masonry section.
 - 4. Remove temporary spreaders before frame installation is complete.
 - 5. Remove temporary braces after wall construction is complete.
 - 6. Install welded frames in prepared openings in concrete and masonry walls using countersunk bolts and expansion shields.
 - 7. Weld field splices in borrowed lite frames and grind smooth.
- C. Knockdown frames: Install in accord with approved shop drawings. Secure using adjustable jamb and base anchors. Complete installation shall have tight-fitting joints, without gaps or offsets.
- D. Fire-rated frames: Install in accord with requirements of NFPA No. 80 and ANSI/SDI A250.11-2012.

3.2 DOOR INSTALLATION:

- A. General:
 - 1. Install doors in accord with SDI-122-07, ANSI/SDI A250.8-2014, manufacturer's product data and approved shop drawings.
 - 2. Install hollow metal doors in frames, using hardware specified in Door Hardware section.

3. Shimming of door hinges is not an acceptable repair of warped doors or door frames out of erection tolerances.
 4. Seal tops of exterior, out-swinging doors prior to painting. Paint bottoms of doors in accord with Painting and Coating section prior to hanging doors.
- B. Edge clearances at doors:
1. Between door and frame, at head and jambs: 1/8".
 2. At meeting edges of pairs of doors and at mullions: 1/8" to 1/4" (1/8" for fire rated doors).
 3. At sills without thresholds: 3/8" maximum above finish floor.
 4. At sills with thresholds: 3/8" maximum above top of threshold.
 5. Between face of door and door stop: 1/16".
- C. Fire-rated doors: Install in accord with requirements of NFPA No. 80, SDI-118-12 and ANSI/SDI A250.11-2012.
- D. Smoke and draft control doors: Install in accord with NFPA 105.

3.3 SITE TOLERANCES:

- A. Allowable erection tolerances:
1. Variation from specified clearances: +1/32".
 2. Variation in face alignment, pairs of doors: +1/16".
 3. Variation in face alignment between door and frame: 1/8" maximum.

3.4 CLEANING AND PROTECTION:

- A. Protect hollow metal doors and frames from damage and staining until Date of Substantial Completion. Replace or repair damaged or stained components.
- B. Replace components which exhibit warp, buckle or broken welds.

End of Section

SECTION 08 1400

WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY:

- A. Related work specified elsewhere:
 - 1. Metal door frames.
 - 2. Door hardware.
 - 3. Glazing.

1.2 SUBMITTALS:

- A. Product data: Submit manufacturer's product description, indicating materials, classifications, factory finish and fabrication. Include manufacturer's proposed warranty. Indicate that doors meet specified requirements, including fire ratings. Include manufacturer's requirements for door installation, care, maintenance and cleaning to obtain specified warranties.
- B. Shop drawings: Submit schedules and elevations indicating door sizes, construction, swing, fire rating, undercut, and hardware locations. Dimension and detail openings for glass lites. Indicate that doors meet specified requirements, including fire ratings.
- C. Samples:
 - 1. Submit 4" by 4" door corner samples indicating construction for each door type.
 - 2. Submit a minimum of 3 samples of each face veneer, 2'-0" by 2'-0" in size, representative of proposed species, cut, color and grain, with proposed factory finish. Accepted samples shall indicate extremes of color, graining, defects and general quality of proposed veneers.
- D. Intent to warrant and certifications: Submit an Intent to Warrant executed by authorized representative of door manufacturer, indicating that manufacturer has reviewed drawings and specifications, conditions affecting the work and the relationship of doors with related work, and that manufacturer proposes to provide warranties as referenced herein without further stipulation.

1.3 QUALITY ASSURANCE:

- A. Allowable color and grain variation of natural finished doors: Color and grain shall be uniform and within range established by accepted veneer samples as specified herein. Joints in face veneers shall be inconspicuous. Adjacent doors and doors viewed together shall have similar color and grain.
- B. Fire door assemblies:
 - 1. Door assemblies in rated walls shall have been tested in accord with NFPA 252 or UL 10C.
 - 2. Door assemblies in corridors and smoke barriers shall have a minimum fire rating of 20 minutes and shall have been tested in accord with NFPA 252 or UL 10C without hose stream test. Assemblies shall comply with UL 1784 for draft and smoke control test; leakage may not exceed 3.0 CFM per foot of door at 0.10" of water column.
 - 3. Fire-rated doors shall provide rating without use of salt-treated wood, or manufacturer shall provide certification that treated wood is non-hygroscopic and shall warrant door against failure or discoloration of face veneer and door finish.

4. For fire doors in exit enclosures the average temperature developed on unexposed side during fire-resistance testing shall not exceed 450°F. at the end of 30 minutes in fire test.
- C. Labeling requirements:
1. On top edge, provide each door with a label which identifies manufacturer, trade association of which he is a member, grade and type of door or industry standard with which it complies.
 2. Fire-rated components shall bear factory-applied labels showing manufacturer's name, name of third-party inspection agency, fire-protection rating, and where required for doors in exit enclosures, maximum transmitted temperature end point. Permanently attach label to hinge stile of each fire-rated door.
 3. Smoke and draft doors complying with UL 1784 shall be labeled as a smoke and draft control door.
- D. Flush doors shall be the product of one manufacturer.
- E. Face veneers shall be domestically assembled veneer facing using no rainforest-produced crossbands or backs.
- F. Applicable standards; as referenced herein:
1. American National Standards Institute (ANSI).
 2. ASTM International (ASTM).
 3. Architectural Woodwork Institute (AWI), "Architectural Woodwork Standards, 2nd Edition, October 1, 2014, herein referred to as AWS Standards.
 4. Hardwood Plywood and Veneer Association (HPVA).
 5. National Fire Protection Association (NFPA).
 6. Underwriters Laboratories, Inc., (UL).
 7. Warnock-Hersey (WH).
 8. Window and Door Manufacturer's Association (WDMA).
- G. Pre-installation meeting: Prior to beginning door installation work, a pre-installation meeting shall be held to review work to be accomplished.
1. Contractor, Architect, door manufacturer's representatives, and other subcontractors who have equipment relating to doors shall be present.
 2. Contractor shall notify all parties at least seven days prior to time for meeting.
 3. Contractor shall record minutes of meeting and distribute to attending parties.
- 1.4 DELIVERY, STORAGE AND HANDLING:
- A. Deliver no doors to building until weatherproof storage space is available. Store doors in a space having controlled temperature and humidity. Stack doors flat, off floor, supported to prevent warpage and protected from damage and direct exposure to sunlight.
 - B. Seal top and bottom edges of doors, if required by manufacturer's product data to maintain warranty.
 - C. Protection for shop-finished doors: Protect doors during shipping and storage by enclosing in polyethylene bags. Replace doors in original packaging for shipment to site following machining and finishing. Hang pre-machined and prefinished doors without removal of packaging. Identify each door with door number on packaging. Maintain packaging in place until Date of Substantial Completion.
 - D. Break packaging seal on site to permit ventilation.

- E. Do not walk or stack other materials on top of stacked doors. Do not drag doors across each other.

1.5 WARRANTIES:

- A. Provide manufacturer's door replacement warranty against warpage, twist, delamination, telegraphing of core and manufacturing defects for the following terms:
 - 1. Interior solid core and mineral core doors: Lifetime of original installation.
 - 2. Door finish for rated doors: Five years against discoloration or failure of factory finish of fire-rated mineral core doors with salt-treated wood components.

PART 2 - PRODUCTS

2.1 FLUSH WOOD DOORS, GENERAL:

- A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards and WDMA I.S.1-A, "Architectural Wood Flush Doors" as indicated herein.
- B. Adhesives: Do not use adhesives that contain urea formaldehyde.
- C. Composite wood products: Products shall be made without urea formaldehyde.

2.2 FLUSH DOORS:

- A. Acceptable manufacturers; subject to compliance with specified requirements:
 - 1. Algoma Hardwoods, Inc.
 - 2. Doormerica.
 - 3. Eggers Industries, Inc.
 - 4. Marshfield DoorSystems, Inc.
 - 5. Oshkosh Door Co.
 - 6. VT Industries, Inc.
- B. General quality standard:
 - 1. Performance grade: Heavy duty.
 - 2. Aesthetic grades: Custom Grade.
- C. Glued particleboard core wood doors:
 - 1. Description: Meeting WDMA and AWS Standards, five-ply veneer face construction, AWS PC-5, particleboard core.
 - a. Thickness: 1-3/4".
 - b. Adhesive bond: Type II or better containing no urea formaldehyde.
 - c. Blocking: Top and bottom rail and lock stile blocking shall accommodate specified hardware, without through-bolting hardware.
 - d. Top rail for doors indicated to receive closers: Provide 12" high top rail for doors scheduled to receive closers. Top rail shall accommodate specified hardware without through-bolting hardware.
 - 2. Particleboard core: Single-piece particleboard meeting ANSI A208.1, Grade LD-2, DPC-1, made with binder containing no urea-formaldehyde resin.
 - 3. Construction: Solid hardwood, engineered laminated hardwood or structural composite lumber stiles and rails glued to core; core assembly sanded for uniform thickness.
 - 4. Crossbanding: Engineered high density fiberboard (HDF), minimum 1/16" thickness.

5. Fire resistance rating: Comply with specified requirements for tested, labeled door construction for ratings indicated on drawings.
- D. Fire-rated mineral core doors:
1. Description: Five-ply non-combustible mineral composition core construction, meeting AWS Standards, Section 9, FD Series and label requirements scheduled on drawings.
 - a. Thickness: 1-3/4".
 - b. Adhesive bond: Type I, containing no urea formaldehyde.
 2. Core: Single piece, non-combustible, asbestos-free, mineral composite with minimum 24 pcf density when tested in accord with ASTM C303-10, with 10 percent maximum moisture absorption by weight with core in equilibrium at 90 percent relative humidity and 70° F.
 3. Construction: Stiles, rails and blocking glued to core; core assembly sanded for uniform thickness. Stiles, rails and blocking shall be non-combustible composition, to receive full mortise hinge installation, with the following minimum characteristics:
 - a. Screw withdrawal resistance: 600 lbs. minimum when tested in accord with ASTM D1037-12.
 - b. Split resistance: 750 lbs. average when tested in accord with ASTM D143-14.
 - c. Blocking: Top and bottom rail and lock stile blocking to accommodate specified hardware, meeting label requirements scheduled.
 4. Crossbanding: Engineered high density fiberboard (HDF), minimum 1/16" thickness. Crossbanding shall be non-salt-treated or door finish shall be warranted by door manufacturer against failure or discoloration.
 5. Fire resistance rating: Comply with specified requirements for tested, labeled door construction for ratings indicated on drawings.
 6. Where rated door pairs require metal astragal for labeled construction, astragals shall be wrapped in veneer matching door face or concealed within door edge.
- E. Facing veneer for transparent finish:
1. Veneer species: Select White Birch.
 2. Veneer slicing: Rotary sliced panels with sequence matched veneers center matched across door width.
 3. Face of door veneer matching: Book matched.
 4. For pairs of doors and doors adjacent to other doors, provide running matched assembly.
 5. Veneer thickness: Minimum 1/52" after sanding at 12% moisture content.
 6. Adhesive bond: Type I, containing no urea formaldehyde.
 7. Quality grade: A veneers.
- F. Vertical stiles:
1. Stiles for transparent finish doors not requiring fire ratings: Minimum 1-3/8" wide by thickness of core with specified veneer, solid hardwood or structural composite lumber inner stile backer with edge veneer matching face veneer in specie, color and graining; no exposed fingerjoints allowed.
 2. Stiles for fire-rated doors: Minimum 1-3/8" wide by thickness of core with specified veneer, solid hardwood or lamination meeting fire rating requirements; edge veneer matching face veneer.
 - a. 20-minute rated pairs without metal edges or astragals: As required by manufacturer to permit positive pressure "S" label per Category H; veneer banded to match face veneer over manufacturer's edge for improved screw holding.
 - b. Mineral core doors required to meet positive pressure Category A (concealed) requirements: As required by door manufacturer.

3. Stile width for doors with cutouts:
 - a. Non-rated doors: Provide minimum 5" of core between lock and light cutout or from edge of door to edge of cutout.
 - b. Rated doors: Provide minimum 5-1/2" core between lock and cutout or from edge of door and edge of cutout.
 - c. Opening next to lock: Provide minimum 10" lock stile.
- G. Rails: Mill option hardwood or structural composite lumber and as required to meet positive pressure ratings.
- H. Moldings and trim:
 1. Furnish in same species as hardwood matching grain and color of face veneer for transparent finish, no fingerjoints allowed.
 2. Moldings for fire-rated doors: Manufacturer's standard matching solid hardwood, laminated wood or primed steel edge meeting fire-rating requirements, Wrap steel edge with veneer matching veneer face in specie, color and graining.
 3. Provide moldings for glass lites and recessed-mounted metal grilles.

2.3 GLAZING:

- A. Refer to Glazing section for tempered glazing.

2.4 FACTORY FITTING, MACHINING AND FINISHING:

- A. Factory fitting and machining are required for all wood doors. Factory finishing is required for all transparent finished doors.
- B. Fitting and machining:
 1. Factory fit and machine doors to clearances and bevels specified.
 2. Prepare for hardware installation using hardware manufacturer's templates.
 - a. Locate in accord with WDMA I. S. 1.7, unless otherwise indicated.
 - b. Drill pilot holes for screws and bolts.
 3. Seal edges of doors and cutouts immediately following fitting and machining.
- C. Openings:
 1. Cut openings to receive glass lites in accord with AWS requirements or WDMA I. S. 1-A.
 2. Seal edges of cutout immediately following cutting using one coat of solvent type sealer.
 3. Install glass lites without looseness or rattle. Trim shall have mitered corner joints and shall conceal edges of cutout and door core.
 4. Protect door faces from damage during cutting.
 5. Prepare and glaze openings in fire-rated doors in accord with NFPA and UL requirements.
- D. Clearances and bevel:
 1. Hinge stile: 1/8".
 2. Lock stile: 1/8".
 3. Top: 1/8".
 4. Bottom: 1/4" above floor finish or threshold, except where undercutting is indicated. Confirm installed floor covering thickness before cutting door bottom edges.
 5. Meeting stiles, pairs of doors: 1/8".
 6. Bevel: 1/8" in 2".
- E. Sanding: Factory sand doors to comply with AWS Standards, Section 9.

- F. Factory finish:
 - 1. Type: WDMA TR-8 or AWS Standards, Section 6, Custom Grade, System AWS System 2 Conversion Varnish or Catalyzed Polyurethane, filled finish. Color and sheen shall be as selected by Architect from manufacturer's full color and sheen range.
 - 2. Finish faces and edges of doors, including mortises and cutouts.

2.5 SOURCE QUALITY CONTROL:

- A. Fabrication tolerances:
 - 1. Overall dimension: $\pm 1/16"$.
 - 2. Width: $+1/32"$.
 - 3. Maximum warp, bow, cup or twist: $1/4"$.
 - 4. Squareness: Maximum $1/8"$ difference in diagonal measurement.
 - 5. Hardware locations: $-0"$, $+1/32"$.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Acclimatization: Allow doors to become acclimated to finished space conditions a minimum of 72 hours before hanging.
- B. Preparation: Verify that framed openings are installed within specified tolerances. Do not install doors in frames which are not installed within size and plumbness tolerances.
- C. Installation:
 - 1. Install doors in accord with manufacturer's product data using scheduled hardware. Install using threaded-to-the-head wood screws furnished by hardware manufacturer.
 - 2. Anchor hardware in correct position and alignment.
 - 3. Adjust hardware and door for proper function and for smooth, free operation, latching without force or excess clearance, within specified clearances and tolerances.
- D. Fire-rated doors: Install in accord with UL requirements and NFPA No. 80-16.
- E. Smoke and draft control doors: Install in accord with NFPA 105-07.
- F. Erection tolerances:
 - 1. Variation from specified clearances: $+1/32"$, $-0"$.
 - 2. Maximum variation in edge alignment, pairs of doors: $1/16"$.
- G. Replace doors with defects in material, finish, fit or machining.

End of Section

SECTION 08 3100
ACCESS DOORS AND PANELS

PART 1 - GENERAL

1.1 SUBMITTALS:

- A. Product data: Indicate material types, finishes and sizes, fabrication and installation details and requirements.
- B. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.2 QUALITY ASSURANCE:

- A. Applicable standards; standards of the following, as referenced herein:
 - 1. ASTM International (ASTM).
 - 2. National Fire Protection Association (NFPA), National Fire Codes.
- B. Labeling requirements:
 - 1. Fire-rated access door assemblies shall bear factory-applied labels showing name of manufacturer, name of third-party inspection agency, test standard, fire-protection rating, and where required for access doors in exit enclosures, maximum transmitted temperature end point.
 - 2. Horizontal access doors shall bear a label that includes the wording "FOR HORIZONTAL INSTALLATION".
 - 3. Permanently attach label to each door, panel and frame.

1.3 DELIVERY, STORAGE AND HANDLING:

- A. Deliver access doors in protective packaging.
- B. Store in packaging to prevent soiling and physical damage.
- C. Handle to prevent damage to finished surfaces and operating mechanisms.

1.4 PROJECT/SITE CONDITIONS:

- A. Protection: Protect prefinished surfaces from damage or staining. Following installation, provide protective covering for duration of project.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND PANELS:

- A. Acceptable manufacturers; subject to compliance with specified requirements:
 - 1. Activar Construction Products Group, Inc., J. L. Industries.
 - 2. Acudor Products, Inc.
 - 3. Babcock Davis Hatchways.
 - 4. Karp Associates, Inc.
 - 5. Nystrom.
- B. Characteristics:
 - 1. Size: As indicated on drawings, but not less than 1'-0" by 1'-0".

2. Types:
 - a. Typical: As required by substrates.
 - b. Non-fire-rated access doors in gypsum board work: Flush type with perforated frame flanges for finishing with joint compound.
3. Construction:
 - a. Non-fire-rated units: Minimum 14 ga. steel sheet for doors; 16 ga. for frames; prime painted.
 - b. Fire-rated units: Minimum 22 ga. steel inside and outside faces; box construction, filled with insulation; 16 ga. frames; prime painted. Horizontal panels shall have been tested in accord with ASTM E119-14 or UL 263 as horizontal assemblies.
4. Hardware:
 - a. Non-fire-rated units: Manufacturer's standard concealed hinges allowing 175 degree operation and cam lock
 - b. Fire-rated panels: Manufacturer's standard continuous piano hinges, self-closing mechanism, interior release and cylinder lock. Provide two keys per lock.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Coordination:
 1. Coordinate installation of access doors required to be built into building structure. Secure templates or lay out to rough dimensions provided by specialty manufacturer.
 2. Ensure that access door orientation and fire ratings comply with fire ratings indicated on drawings.
 3. Coordinate with mechanical and plumbing sizes and locations of access doors.
 4. Coordinate access door types with final finish of adjacent wall.

3.2 INSTALLATION:

- A. Install access doors in accord with manufacturer's product data, plumb, level and true to line and location.
- B. Install access doors with fasteners of type and spacing recommended by manufacturer's product data.
- C. Set fire rated access doors at locations and elevations indicated and in accord with NFPA 80.
- D. Protect surfaces from damage or staining. Clean surfaces prior to Date of Substantial Completion.
- E. Test and adjust hardware for ease of operation.

End of Section

SECTION 08 4113

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 PERFORMANCE REQUIREMENTS:

- A. Delegated design: Engage a professional engineer registered in the state of Georgia, to design aluminum-framed entrances and storefronts.
- B. Design criteria; glazed storefront framing without doors or operable vents:
 - 1. Design storefront and entrance framing systems to provide for such expansion and contraction of component materials as will be caused by a surface temperature range of 160°F. without causing buckling, stresses on glass, failure of joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance, or other detrimental effects. Operating windows and doors shall function normally over this temperature range.
 - 2. Structural performance:
 - a. Complete storefront and entrance framing system shall be designed to withstand wind loading complying with local codes; the International Building Code, 2006 Edition loads acting normal to wall plane. Test per ASTM E330-14, Procedure A.
 - b. Deflection of framing members in a direction normal to wall plane, when subjected to a uniform load deflection test at design pressures specified above, in accord with ASTM E330-14, Procedure A, shall not exceed 1/175 of its clear span except that when a plastered surface subjected bending is affected, deflection shall not exceed 1/360 of the span.
 - c. No glass breakage. Conduct uniform load structural test in accord with ASTM E330-14, Procedure A.
 - 1) Inward and outward test pressures shall be equal to 1.5 times inward and outward acting design wind pressures specified herein.
 - 2) At conclusion of tests, there shall be no glass breakage, permanent damage to fasteners or anchors, hardware parts or actuating mechanism.
 - 3) Windows, doors and operating hardware shall function satisfactorily. Storefront and entrance framing members shall have no permanent deformation.
 - d. Deflection of members in a direction parallel to wall plane, when carrying their full load, shall not exceed an amount which will reduce the glass bite below 75% of the design dimension and the member shall have a 1/8" minimum clearance between itself and the top of the fixed panel, glass, or other fixed part immediately below. Clearance between the member and an operable window or door shall be at least 1/16".
 - 3. Static pressure air infiltration:
 - a. Air leakage rate through fixed light areas of storefront system shall not exceed 0.06 cfm per square foot when tested in accord with ASTM E283-04(2012) at a differential static pressure of 6.24 psf.
 - b. Air leakage rate through entrance doors shall not exceed 1.0 cfm per square foot when tested in accord with ASTM E283-04(2012) at a differential static pressure of 1.57 psf.

4. Static pressure water infiltration:
 - a. Water penetration is defined as the appearance of uncontrolled water other than condensation on the indoor face of wall construction.
 - b. Make provision for water entering at joints and condensation occurring within wall construction to drain to exterior face.
 - c. Fixed light areas of storefront shall permit no uncontrolled water penetration when tested in accord with ASTM E331-00(2009). Differential static pressure used in the test shall be 10% of the upward acting design wind load specified herein but not less than 10.0 psf.
5. Thermal transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than 0.44 (low-e) or 0.61 (clear) BTU/hr/ft²/°F.
6. Condensation resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than 62_{frame} and 68_{glass} (low-e).

1.2 SUBMITTALS:

- A. Shop drawings: Indicate in elevation with sections and details at full scale. Include glass and metal thicknesses, joining details, field connections, anchorage, provisions for expansion, fastening and sealing methods, splice details, reinforcement, metal finishes and glazing accessories. Indicate relationship to adjacent work. Indicate compliance with specified design criteria.
- B. Product data: Provide manufacturer's complete product description, including test reports, certifying that system meets specified design criteria. Submit structural calculations for project conditions.
- C. Test reports: Submit for Architect's information only.
 1. Submit reports by an independent Testing Laboratory that storefront system proposed for use has been tested for compliance with specified design criteria.
 2. Tests shall have been made for essentially similar systems having similar glass sizes, mullion lengths, reinforcement and methods of attachment.
 3. Tests shall indicate satisfactory testing to at least structural performance criteria specified.
 4. If test data is not available for proposed systems or if data does not represent project conditions, Contractor shall be responsible for securing satisfactory tests by an independent Testing Agency acceptable to Architect. Costs for such testing shall be borne by Contractor.
- D. Glass manufacturer's approval: Indicate on shop drawings, or by letter prior to submission of shop drawings, that selected glass manufacturers have reviewed and approved details, including glass bite, clearances, system weepage, air circulation around interior window treatments, shading by exterior building components and glazing methods.
- E. Samples:
 1. Visual samples: Submit minimum 6" by 6" samples indicating full range of color to be expected in finished work.
 2. Sealant adhesion test samples: Provide samples of specified metal finish for adhesion tests by sealant manufacturer, as specified in Joint Sealants section.

- F. Maintenance data: Submit as part of Contract closeout documents. Give instructions for general maintenance and repair of surfaces and finishes. Include detailed re-glazing procedures.
- G. Delegated-design submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the registered professional engineer responsible for their preparation.

1.3 QUALITY ASSURANCE:

- A. Applicable standards; standards of the following, as referenced herein:
 - 1. Aluminum Association (AA).
 - 2. American Architectural Manufacturers Association (AAMA).
 - 3. American Welding Society (AWS).
 - 4. ASTM International (ASTM).
 - 5. Glass Association of North America (GANA).
 - 6. Society for Protective Coatings (SSPC).

1.4 JOB CONDITIONS:

- A. Protection: Protect aluminum surfaces from contact with lime, mortar, cement, acids and other harmful surfaces and from careless handling, storage or machining.

1.5 WARRANTY:

- A. Manufacturer's warranty: Warrant the work of this section for three years from Date of Substantial Completion to be free from defects in workmanship and materials and that the work conforms to the final shop drawings. Warranty shall apply to both patent and latent defects but shall not include damage caused by exclusions stated in manufacturer's warranty.
- B. Finish warranty: Warrant fluoropolymer coating to remain free of checking, crazing, peeling, chalking or fading for a period of five years, beginning at Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Acceptable manufacturers; subject to compliance with specified requirements.
 - 1. Basis of design: Kawneer North America.
 - 2. EFCO Corp., a Pella Company.
 - 3. Gardner Metal Systems, Inc.
 - 4. Oldcastle BuildingEnvelope™.
 - 5. YKK AP America, Inc.

2.2 MATERIALS AND FINISH:

- A. Structural characteristics of aluminum shall be in accord with AA "Specification for Aluminum Structures."
- B. Aluminum extruded bars, rods, shapes, and tubes: Meeting ASTM B221-14; alloy, temper and wall thickness as required to meet design criteria.

- C. Aluminum sheet and plate: 5005-H34 aluminum alloy meeting ASTM B209-14 minimum 0.050" thickness
- D. Bars, rods and wire: Meeting ASTM B211-12.
- E. Standard structural shapes: Meeting ASTM B308-10.
- F. Carbon steel:
 - 1. Structural shapes, plates and bars: Meeting ASTM A36-14.
 - 2. Sheet and strip, cold rolled, structural quality: ASTM A1008-13, Grades A through E.
 - 3. Sheet and strip, hot rolled Structural quality: ASTM A1011-14, Grades A through E.
 - 4. Sheet, hot dip galvanized, structural quality: Meeting ASTM A653-13, Grades A through F.
 - 5. Sheet, electrolytic zinc coated: Meeting ASTM A879-12.
- G. Fasteners: Exposed fasteners shall be countersunk and shall match entrances and storefronts in color.
 - 1. Aluminum to aluminum: Aluminum or Type 304 stainless steel.
 - 2. Aluminum to stainless steel or carbon steel: Type 304 Stainless steel.
- H. Protective coatings for metals:
 - 1. Painting for carbon steel and high strength steel:
 - a. Dry environment: SSPC-PS 1.09, Three-Coat Oil Base Zinc Oxide Painting System.
 - b. Frequently wet environment: SSPC-PS 13.01, Epoxy-Polyamide Painting System.
 - c. Frequently wet salt water environment: SSPC-PS 12.01, One-Coat Zinc Rich Painting System.
 - 2. Galvanizing of carbon steel:
 - a. Steel sheets: Meeting ASTM A653-13.
 - b. Hot dip for shapes, plates, bars and strips: Meeting ASTM A123-13.
 - c. Electro-galvanizing: Meeting ASTM B633-13.
 - d. Weight of coating: Meeting ASTM A123-13, Grade 65.
 - 3. Cold galvanizing compound: Pre-mixed, zinc dust and organic binders formulated specifically for use on steel surfaces. Compounds shall have concentrations of zinc dust in the range of 65% to 69% or above 92% in the dried film in accord with ASTM A780-09.
- I. Finish:
 - 1. Exposed aluminum components and components to which exterior sealant is applied: Fluoropolymer coating finish:
 - a. Two coat, shop-applied, baked-on, fluoropolymer coating system based on minimum 70% Arkema Group, Kynar 500 or Solvay Solexis, Inc., Hylar 5000 resin (Polyvinylidene fluoride, PVDF), formulated by a licensed manufacturer and applied by manufacturer's approved applicator to meet AAMA 2605-05.
 - b. Color: As selected by Architect from manufacturer's product data.
 - 2. Unexposed aluminum components: Mill finish.

2.3 ENTRANCE DOORS:

- A. Wide stile design: Minimum 5" wide stiles, 6" wide top rail and 10" wide bottom rail.

- B. Door construction: Fabricated of extruded aluminum sections with door corners joined by concealed reinforcement, secured with bolts and screws and by Sigma deep penetration welding.
- C. Glazing:
 - 1. Snap-in stops with neoprene glazing gaskets.
 - 2. Glass and glazing accessories shall be as specified in Glazing section.
- D. Drip cap: Provide doors with drip cap at head and bottom rail to prevent water infiltration.
- E. Adjustment: Doors equipped with adjusting mechanism located in top rail near lock stile, providing for minor clearance adjustments after installation.
- F. Weatherstripping: Pile type in replaceable rabbets for stiles and rails; complying with AAMA 701.2/702.
- G. Hardware: Provide as specified in Door Hardware section.

2.4 STOREFRONTS AND ENTRANCE FRAMING SYSTEM:

- A. The basis of design for storefront system is Kawneer TriFab VG 451T Center Plane System. Storefront systems of similar design and construction, as manufactured by other acceptable manufacturers, may be submitted for Architect's consideration. Acceptance is subject to compliance with specified design criteria, as evidenced by submittal of specified product data, and Architect's approval.
- B. Framing characteristics:
 - 1. Member size: 2" by 4-1/2".
 - 2. System: Two-piece face and gutter, for outside glazing.
 - 3. Construction: Shear block or screw spline.
 - 4. Glazing gaskets: As specified in Glazing section.
 - 5. Make provisions in framing for minimum edge clearance, nominal edge cover, and nominal pocket width for thickness and type of glazing material indicated on drawings. Provisions shall be in accord with glazing material manufacturer's product data.
 - 6. Framing shall accommodate entrance doors indicated in door schedule and other components indicated on drawings. Bottom rail of framing adjacent to entrance doors shall match bottom rail of entrance doors.
 - 7. Provide framing with reinforcing members meeting design wind loading and design criteria in accord with shop drawings. Subframes and reinforcing members of carbon steel shall have a shop applied protective coating as specified herein.
- C. Sealants:
 - 1. Storefront sealant: Non-skinning sealant meeting AAMA Publication 800-05 with addenda; color matching storefront color.
 - 2. Perimeter sealant: As specified in Joint Sealants section.
 - 3. Glazing sealants: as recommended by manufacturer.
 - a. Sealant shall have a VOC content of 250 g/L or less.
- D. Weep hole filter material: 1/2" square by 6" long; 30-40 ppi, open cell, reticulated, polyvinyl chloride-coated, polyurethane foam block.

- E. Framing anchors: Series 300 stainless steel for exposed fasteners and fasteners 1/4" diameter and smaller; heavy zinc-plated steel, (0.0005" thickness plating), colored chromate-coated for fasteners over 1/4" diameter. Framing anchors shall carry dead load, accommodate thermal movement, resist wind load specified herein and withstand normal loads imposed by entrance door operation.
- F. Bituminous paint: Cold-applied asphalt emulsion complying with ASTM D1187-97(2011).
- G. Fabricate trim pieces from sheet or plate aluminum meeting requirements specified herein.
- H. Flashings and other materials used internally or externally shall be corrosion resistant, non-staining, non-bleeding and compatible with adjoining materials.

2.5 FABRICATION:

- A. General: Storefront and entrance systems shall be of materials, design, sizes and thicknesses, subject to commercial tolerances, indicated on approved shop drawings and specified herein. Methods of fabrication and assembly, unless specifically stated otherwise, shall be at manufacturer's discretion.
- B. Joints: Fabricate and assemble framing with joints only at intersections of members. Match exposed work to produce continuity of line and design, with joints, unless indicated otherwise, being accurately fitted and rigidly secured.
- C. Hardware: Drill and cut to template for finish hardware. Reinforce frames and door stiles and rails to receive finish hardware in accord with door manufacturer's product data.
- D. Protection of metals: Protect against galvanic action wherever dissimilar metals are in contact. Provide protection by painting contact surfaced with zinc chromate primer as specified herein or by application of a sealant or tape.
- E. Welding:
 - 1. Welding shall be in accord with AWS criteria and shall be done with electrodes and by methods recommended by suppliers of metals being welded. Type, size and spacing of welds shall be as indicated on approved shop drawings.
 - 2. Perform welding behind finished surfaces so as to minimize distortion and discoloration on finished side. Remove weld spatter and welding oxides on finished surfaces by descaling and grinding.
- F. Shop painting of steel: Items of steel, unless galvanized or scheduled for other finish, shall be cleaned of loose scale, dirt and foreign matter in accord with SSPC-SP 6/NACE No. 3, Commercial Blast Cleaning, and shall be coated/primed as specified herein.
- G. Sealants and sealing materials: Use sealants and sealing materials in accord with material manufacturer's product data and joints shall be in accord with designs and tolerances indicated on approved shop drawings.
- H. Shop glazing: Perform glazing work in accord with recommendations of GANA Glazing Manual and glazing material manufacturer's product data.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Storefronts: Establish bench marks at convenient points adjacent to each entrance. Be responsible for accuracy of location of perimeter lines and elevation of bench marks.
- B. Correction of errors: Should errors be found in location or elevation of perimeter lines and elevation of bench marks, installation of work shall not proceed in affected areas until errors have been corrected.

3.2 INSTALLATION:

- A. Install aluminum entrances and storefronts in accord with manufacturer's product data and approved shop drawings, plumb, level and true to line, in proper alignment and relation to established lines and grades, within specified tolerances.
- B. Anchor entrance doors in place, straight, plumb and level, without distortion, in accord with approved shop drawings. Check and adjust weatherstripping contact and hardware movement for proper operation and performance of units.
- C. Erection tolerances: Components of storefront system shall be within the following tolerances:
 - 1. Maximum variation from plane or location indicated on approved shop drawings: 1/8" per 12'-0" of length or 1/2" in any total length.
 - 2. Maximum offset from true alignment between two members abutting end to end in line: 1/16".
 - 3. Maximum offset between framing members at corners of glazing pocket: 1/32".
- D. Installation within masonry openings: No parts other than built-in anchor devices shall be installed until masonry work is completed and cleaned.
- E. Protect aluminum in contact with masonry, steel, concrete or other dissimilar material from contact by neoprene gaskets or bituminous paint.
- F. Before anchoring to structure, shim and brace work plumb, level and in designated location. Anchorage of storefront framing to building structure shall be in accord with approved shop drawings. After wall is positioned, connections indicated on approved shop drawings shall be rigidly fixed.
- G. Welding: Protect glass and finished surfaces from damage from weld spatter. Welds and adjacent metal shall be cleaned and primed with primer specified herein.
- H. Provide sill flashing at exterior storefronts. Flashing shall extend continuous, with joints lapped and set in storefront sealant. Provide end dams minimum 2" high.
- I. Install weep hole baffle with filter at weep holes. Install filter under 30% compression.
- J. During installation, verify that storefront system allows water which enters the system to be collected in gutters and weeped to exterior. Ascertain that weep holes are open and that metal-to-metal joints are sealed.

- K. Locate expansion mullions in accord with manufacturer's recommendations as indicated on approved shop drawings.
- L. Caulking:
 - 1. Caulk metal-to-metal internal storefront joints using storefront sealant. Install in accord with Joint Sealants section.
 - 2. Caulk perimeter of storefronts using silicone sealant as specified in Joint Sealants section. Caulk both exterior and interior faces of storefront perimeter.
 - 3. Caulk fasteners heads penetrating storefront jamb, sill and head members.
- M. Clean exposed aluminum surfaces at completion of work, just prior to Date of Substantial Completion. Repair or replace work damaged or stained by subsequent work.
- N. Field tests: Conduct to ascertain that storefront system is watertight. Conduct generally in accord with AAMA 501.2. A minimum of two tests shall be performed. Tests shall be performed in the presence of Architect.

End of Section

SECTION 08 7100

DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SUMMARY:

- A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.
- B. This Section includes the following:
 - 1. Hinges
 - 2. Continuous hinges
 - 3. Key control system
 - 4. Lock cylinders and keys
 - 5. Lock and latch sets
 - 6. Bolts
 - 7. Exit devices
 - 8. Push/Pull units
 - 9. Closers
 - 10. Overhead holders
 - 11. Miscellaneous door control devices
 - 12. Door trim units
 - 13. Protection plates
 - 14. Weatherstripping for exterior doors
 - 15. Sound stripping for interior doors
 - 16. Thresholds
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 01330: Submittals
 - 2. Section 08110: Hollow Metal Doors
 - 3. Section 08210: Wood Doors
- D. Products furnished but not installed under this Section to include:
 - 1. Cylinders for locks on entrance doors.
 - 2. Final replacement cores and keys to be installed by Owner.

1.3 REFERENCES:

- A. Standards of the following as referenced:
 - 1. American National Standards Institute (ANSI)
 - 2. Door and Hardware Institute (DHI)
 - 3. Factory Mutual (FM)
 - 4. National Fire Protection Association (NFPA)
 - 5. Underwriters' Laboratories, Inc. (UL)
 - a. UL 10C - Fire Tests Door Assemblies
 - 6. Warnock Hersey

- B. Regulatory standards of the following as referenced:
 - 1. Department of Justice, Office of the Attorney General, Americans with Disabilities Act, Public Law 101-336 (ADA).
 - 2. CABO/ANSI A117.1: Providing Accessibility and Usability for Physically Handicap People, 1992 edition.

1.4 SYSTEM DESCRIPTION:

- A. Refer to applicable "Headings" for system description for electric and electro-pneumatic hardware products.

1.5 SUBMITTALS:

- A. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements. For items other than those scheduled in the "Headings" of Section 3, provide catalog information for the specified items and for those submitted.

- B. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into vertical format "hardware sets" indicating complete designations of every item required for each door or opening. Use specification Heading numbers with any variations suffixed a, b, etc. Include the following information:
 - a. Type, style, function, size, and finish of each hardware item.
 - b. Name and manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of each hardware set, cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
 - e. Explanation of all abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for hardware.
 - g. Door and frame sizes and materials.
 - h. Keying information.

- C. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not. All hardware shall comply with standards UBC 702 (1997) and UL 10C.
 - 1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL labels indicating "Fire Door to be equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware".

1.7 PRODUCT HANDLING:

- A. Tag each item or package separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.
- B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.
- C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).
- E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.8 WARRANTY:

- A. Special warranties per manufacturer:
 - 1. Door Closers: Twenty-five year period
 - 2. Exit Devices: Ten year period
 - 3. Locksets: Limited lifetime

1.9 MAINTENANCE:

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

- B. Parts kits: Furnish manufacturers' standard parts kits for locksets, exit devices, and door closers.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS:

(* Denotes manufacturer referenced in the Hardware Headings)

A. Hinges:

1. Acceptable manufacturers:
 - a. Bommer
 - b. PBB*
 - c. Stanley
2. Characteristics:
 - a. Templates: Provide only template-produced units.
 - b. Screws: Provide Phillips flat-head screws complying with the following requirements:
 - 1) For metal doors and frames install machine screws into drilled and tapped holes.
 - 2) For wood doors and frames install threaded-to-the-head wood screws.
 - 3) For fire-rated wood doors install #12 x 1-1/4 inch, threaded-to-the-head steel wood screws.
 - 4) Finish screw heads to match surface of hinges or pivots.
 - c. Hinge pins: Except as otherwise indicated, provide hinge pins as follows:
 - 1) Out-Swing Exterior Doors: Non-removable pins.
 - 2) Out-Swing Corridor Doors with Locks: Non-removable pins.
 - 3) Interior Doors: Non-rising pins.
 - 4) Tips: Flat button and matching plug. Finished to match leafs.
 - d. Size: Size hinges in accordance with specified manufacturer's published recommendations.
 - e. Quantity: Furnish one pair of hinges for all doors up to 5'0" high. Furnish one hinge for each additional 2-1/2 feet or fraction thereof.

B. Continuous Hinges:

1. Acceptable manufacturers:
 - a. Markar
 - b. Select Products*
 - c. Zero
2. Characteristics:
 - a. Continuous gear hinges to be manufactured of extruded 6063-T6 aluminum alloy with anodized finish, or factory painted finish as scheduled.

- b. All hinges are to be manufactured to template. Uncut hinges shall be non-handed and shall be a pinless assembly of three interlocking extrusions applied to the full height of the door and frame without mortising.
 - c. Vertical door loads shall be carried on chemically lubricated polyacetal thrust bearings. The door and frame leaves shall be continually geared together for the entire hinge length and secured with a full cover channel. Hinge to operate to a full 180°.
 - d. Hinges to be milled then anodized and assembled in matching pairs. Fasteners supplied shall be 410 stainless steel, plated and hardened.
 - e. Provide UL listed continuous hinges at fire doors. Continuous hinges at fire doors (suffix -FR) shall meet the required ratings without the use of auxiliary fused pins or studs.
- C. Pivot Sets:
- 1. Acceptable manufacturers:
 - a. ABH*
 - b. Ives
 - c. Rixson
 - 2. Characteristics:
 - a. Pivots to be high strength forged bronze with top pivot housing with spring activated bronze retracting pin. Pivots to have tilt-on bearing and bearing pin.
- D. Cylinders:
- 1. Acceptable manufacturers:
 - a. Corbin Russwin
 - b. PDQ*
 - c. Schlage
 - 2. Characteristics:
 - a. Review the keying system with the Owner and provide the type required.
 - b. Equip locksets with manufacturer's special tumbler cylinder with construction master key feature that permits voiding of construction keying without cylinder removal
 - c. Metals: Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.
 - d. Comply with Owner's instructions for master keying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.
 - 1) Permanently inscribe each key with number of lock that identifies cylinder manufacturer's key symbol, and notation, "DO NOT DUPLICATE."
 - e. Key Material: Provide keys of nickel silver only.
 - f. Key Quantity: Furnish 3 change keys for each lock, 5 master keys for each master system, 5 grandmaster keys for each

grandmaster system, and, if needed, 5 control keys for interchangeable core series.

- 1) Furnish one extra blank for each lock.
- 2) Deliver keys to Owner.

E. Locksets, Latchsets, Deadbolts:

1. Acceptable manufacturers:
 - a. Corbin Russwin
 - b. PDQ*
 - c. Schlage
2. Cylindrical Locksets and Latchsets: as scheduled.
 - a. Chassis: cylindrical design, corrosion-resistant plated cold-rolled steel.
 - b. Latchbolt: 9/16" throw.
 - c. Lever Trim: accessible design as scheduled.
 - d. Electric operation: Manufacturer-installed continuous duty solenoid.
 - e. Strikes: Conforms to ANSI 115.2.
 - f. Scheduled Lock Series and Design: MR series, PHL lever design.
 - g. Certifications:
 - 1) ANSI A156.2, Series 4000, Grade 1

F. Exit Devices:

1. Acceptable manufacturers:
 - a. Precision
 - b. PDQ*
 - c. Von Duprin
2. Characteristics:
 - a. Exit devices shall be "UL" listed for life safety. All exit devices for fire rated openings shall have "UL" labels for "Fire Exit Hardware."
 - b. All exit devices mounted on labeled wood doors shall be mounted on the door per the door manufacturer's requirements.
 - c. All trim shall be thru-bolted to the lock stile case.
 - d. All exit devices shall be made of brass, bronze, stainless steel, or aluminum material, powder coated, anodized, or plated to the standard architectural finishes to match the balance of the door hardware.
 - e. Provide glass bead conversion kits to shim exit devices on doors with raised glass heads.
 - f. All exit devices shall be one manufacturer. No deviation will be considered.
 - g. All exit devices shall be non-handed. Touchpad shall extend a minimum of 1/2 of the door width and shall extend to the height of the cross rail housing for a "no pinch" operation. Plastic touchpads are not acceptable. All latchbolts to be the deadlocking type.
 - h. Surface vertical rod devices shall be UL labeled for fire door applications without the use of bottom rod assemblies. Where bottom rods are required for security applications, the devices

shall be UL labeled for fire doors applications with rod and latch guards by the device manufacturer.

- G. Closers and Door Control Devices:
1. Acceptable manufacturers:
 - a. LCN
 - b. PDQ*
 - c. Sargent
 2. Characteristics:
 - a. Door closers shall have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder.
 - b. All closers shall utilize a stable fluid withstanding substantial temperature range without seasonal adjustment of closer speed to properly close the door.
 - c. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed and back check.
 - d. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped provide adjustable units complying with ADA and ANSI A-117.1 provisions for door opening force.
 - e. Closers to be installed to allow door swing as shown on plans. Doors swinging into exit corridors shall provide for corridor clear width as required by code. Where possible, mount closers inside rooms.
- H. Overhead Door Holders:
1. Acceptable manufacturers:
 - a. ABH*
 - b. Glynn Johnson
 - c. Rixson Firemark
 2. Characteristics:
 - a. Provide medium duty door holders (concealed and surface mounted) of stainless steel.
 - b. Concealed holders to be installed with the jamb bracket mortised flush with the bottom of the jamb. The arm and channel to be mortised into the door.
 - c. Surface holders to be installed with the jamb bracket mounted on the stop.
- I. Floor Stops and Wall Bumpers:
1. Acceptable manufacturers:
 - a. Burns*
 - b. Hiawatha
 - c. Trimco
 2. Characteristics: Refer to Hardware Headings.

- J. Door Bolts/Coordinators:
1. Acceptable manufacturers:
 - a. Burns*
 - b. Hiawatha
 - c. Trimco
 2. Characteristics:
 - a. Flush bolts to be forged brass 6-3/4" x 1", with 1/2" diameter bolts. Plunger to be supplied with milled surface one side that fits into a matching guide.
 - b. Automatic flush bolts to be UL listed as top and bottom bolts on a pair of classified fire doors. Bolt construction to be of rugged steel and brass components.
 - c. Self latching flush bolts to be UL listed as top and bottom bolts on a pair of classified fire doors. Bolt construction to be of rugged steel and brass components.
 - d. Automatic flush bolts and self-latching flush bolts shall be UL listed for fire door application without bottom bolts (LBB).
 - e. Coordinator to be soffit mounted non-handed fully automatic UL listed coordinating device for sequential closing of paired doors with or without astragals.
 - f. Provide filler pieced to close the header. Provide brackets as required for mounting of soffit applied hardware.
- K. Protective Plates:
1. Acceptable manufacturers:
 - a. Burns*
 - b. Hiawatha
 - c. Trimco
 2. Characteristics:
 - a. Provide manufacturers standard exposed fasteners for door trim units consisting of either machine screws or self-tapping screws.
 - b. Materials:
 - 1) Metal Plates: Stainless Steel, .050 inch (U.S. 18 gage).
 - c. Fabricate protection plates not more than 2 inches less than door width on hinge side and not more than 1 inch less than door width on pull side.
 - d. Heights:
 - 1) Kick plates to be 10 inches in height.
 - 2) Mop plates to be 4 inches in height.
 - 3) Armor plates to be 36 inches in height. Armor plates on fire doors to comply with NFPA 80.
- L. Thresholds:
1. Acceptable manufacturers:
 - a. National Guard Products, Inc.*
 - b. Reese Industries
 - c. Zero Weatherstripping Co., Inc.

2. Types: Indicated in Hardware Headings.
- M. Door Seals/Gasketing:
1. Acceptable manufacturers:
 - a. National Guard Products, Inc.*
 - b. Reese Industries
 - c. Zero Weatherstripping Co., Inc.
 2. Types: Indicated in Hardware Headings.
- N. Silencers:
1. Acceptable manufacturers:
 - a. Burns*
 - b. Deutscher
 - c. Ives
 2. Three for each single doors; four for pairs of doors.
- O. Key Cabinet and System:
1. Acceptable manufacturers:
 - a. Telkee, Inc.
 - b. Lund
 2. Provide a key control system including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150 percent of the number of locks required for the Project.
 - a. Provide complete cross index system set up by key control distributor, and place keys on markers and hooks in the cabinet as determined by the final key schedule.
 - b. Provide hinged-panel type cabinet for wall mounting.
- P. Security Equipment:
1. Acceptable manufacturers:
 - a. Detex
 - b. Dynalock
 - c. PDQ
 - d. Von Duprin
 2. Characteristics:
 - a. Provide items as found in Hardware Headings.
 3. Coordinate security equipment with Electrical.

2.2 MATERIALS AND FABRICATION:

- A. Manufacturer's Name Plate: Do not use manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise acceptable to Architect.

1. Manufacturer's identification will be permitted on rim of lock cylinders only.
- B. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI/BHMA A156 series standards for each type of hardware item and with ANSI/BHMA A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.
- C. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
 1. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.
 2. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
 3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners.
 4. Do not use thru-bolts or sex bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of adequately fastening the hardware, or otherwise found in Headings. Coordinate with wood doors and metal doors and frames where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

2.3 HARDWARE FINISHES:

- A. Match items to the manufacturer's standard color and texture finish for the latch and lock sets (or push-pull units if no latch or lock sets).
- B. Provide finishes that match those established by ANSI or, if none established, match the Architect's sample.
- C. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
- D. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze, and aluminum, except as otherwise indicated. The suffix "-NL" is used with standard finish designations to indicate "no lacquer."

- E. The designations used to indicate hardware finishes are those listed in ANSI/BHMA A156.18, "Materials and Finishes," including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.
1. Hinges (Exterior): 630 (US32D) Satin Stainless Steel
 2. Hinges (Interior wood doors): 652 (US26D) Satin Chrome Plated Steel
 3. Hinges (Interior metal doors): 600 (USP)
 4. Continuous Hinges: 628 (US28) Clear Anodized Aluminum
 5. Flush Bolts: 626 (US26D) Satin Chrome Plated Brass/Bronze
 6. Locks: 626 (US26D) Satin Chrome Plated Brass/Bronze
 7. Exit Devices: Match adjacent hardware
 8. Door Closers: Match adjacent hardware
 9. Protective Plates: 630 (US32D) Satin Stainless Steel
 10. Door Stops: 626 (US26D) Satin Chrome Plated Brass/Bronze
 11. Overhead Holders: 630 Satin Stainless Steel
 12. Thresholds/Weatherstripping: 627/628 (US27/US28) Aluminum

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.
1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
 2. "Recommended Locations for Builders Hardware for Custom Steel Doors and Frames" by the Door and Hardware Institute.
 3. NWWDA Industry Standard I.S.1.7, "Hardware Locations for Wood Flush Doors."
- B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.
- C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section "Joint Sealers".

- F. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.2 ADJUSTING, CLEANING, AND DEMONSTRATING:

- A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.
 - 1. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to function properly with final operation of heating and ventilating equipment.
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Door Hardware Supplier's Field Service
 - 1. Inspect door hardware items for correct installation and adjustment after complete installation of door hardware.
 - 2. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.
 - 3. File written report of this inspection to Architect.
- D. Prior to project completion, representatives of the lock, exit device and overhead closer manufacturers shall inspect and adjust all units and certify that all units are installed in accordance with the manufacturer's instructions, and are regulated properly and functioning correctly. A written report shall be provided to the Architect as to the inspection and shall include appropriate certificates.

HEADING #1

DOORS #: G112A, G120A, M112, M113

EACH DOOR TO HAVE:

1	CONTINUOUS HINGE	SL24HD
1	DEADLOCK	KT148
1	PUSH/PULL SET	54M26D X 74 X TYPE 12 MTG.
1	CLOSER	7101RAHO
1	OVERHEAD STOP	1020 SERIES (@ G112A, G120A)
1	KICK PLATE	KP50 X B4E X CSK
1	MOP PLATE	MP50 X B4E X CSK
1	DOOR STOP	565/522 (AS REQ. @ M112, M113)

NOTE: COORDINATE OVERHEAD STOP WITH CLOSER.

HEADING #2

DOORS #: G112B, G120B

EACH DOOR TO HAVE:

3	HINGES	BB81
1	PRIVACY SET	MR176
1	DOOR STOP	565/522 (AS REQUIRED)
1	COAT HOOK	604

HEADING #3

DOORS #: G121A, M109B, M109C

EACH PAIR TO HAVE:

2	CONTINUOUS HINGES	SL18HD
1	EXIT DEVICE	6201R X 629044
1	EXIT DEVICE	6201R
1	REMOVABLE MULLION	9200M-11
4	CYLINDERS	TO MATCH NEW SYSTEM
2	PULLS	M39-1D X 9HD MTG.
2	CLOSERS	7101DSHO X SCS-1
2	KICK PLATES	KP50 X B4E X CSK
1	THRESHOLD	513
1	SET DOOR SEALS	155S
2	DOOR BOTTOM SEALS	200S
1	ASTRAGAL SET	9115S

HEADING #4

DOORS #: G121B

EACH PAIR TO HAVE:

2	CONTINUOUS HINGES	SL11HD
1	EXIT DEVICE	6212R X 629044
1	EXIT DEVICE	6212R
1	REMOVABLE MULLION	9200M-11
4	CYLINDERS	TO MATCH NEW SYSTEM
2	PULLS	M39-1D X 9HD MTG.
2	CLOSERS	7101DSHO X SCS-1
1	THRESHOLD	513
1	SET DOOR SEALS	BY DOOR MANUFACTURER
2	DOOR BOTTOM SEALS	200S
1	ASTRAGAL SET	BY DOOR MANUFACTURER

NOTE: PROVIDE CLOSER ADAPTOR PLATES AS REQUIRED.

HEADING #5

DOORS #: G122A, G122B, G123A

EACH DOOR TO HAVE:

3	HINGES	4B81
1	EXIT DEVICE	6200R-F 08 6 EW
1	CLOSER	7101RA
1	DOOR STOP	565/522 (AS REQ.)
1	KICK PLATE	KP50 X B4E X CSK
1	SET DOOR SEALS	5075

HEADING #6

DOORS #: G122C, G123B

EACH DOOR TO HAVE:

1	CONTINUOUS HINGE	SL18HD
1	EXIT DEVICE	6201R
1	CYLINDER	TO MATCH NEW SYSTEM
1	PULL	M39-1D X 9HD MTG.
1	CLOSER	7101DSHO
1	KICK PLATE	KP50 X B4E X CSK
1	THRESHOLD	425
1	SET DOOR SEALS	155S
1	DOOR BOTTOM SEAL	200S
1	DRIP STRIP	17

HEADING #7

DOORS #: G124A, G125A, G126A, M101, M106, M107, M108, M110, M111,
M116

EACH DOOR TO HAVE:

1	CONTINUOUS HINGE	SL24SD
1	LOCKSET	MR148
1	DOOR STOP	565/522 (AS REQ.)
1	SET DOOR SEALS	5075

NOTE: EXCEPTION FOR NO CLOSER ON 20-MIN CORRIDOR DOOR.

HEADING #8

DOORS #: G124B, G125B, G126B

EACH DOOR TO HAVE:

1	CONTINUOUS HINGE	SL18HD
1	LOCKSET	MR117
1	CLOSER	7101DSHO
1	KICK PLATE	KP50 X B4E X CSK
1	THRESHOLD	425
1	SET DOOR SEALS	155S
1	DOOR BOTTOM SEAL	200S

HEADING #9

DOORS #: M103

EACH DOOR TO HAVE:

1	CONTINUOUS HINGE	SL24HD
1	LOCKSET	MR115
1	CLOSER	7101RA
1	KICK PLATE	KP50 X B4E X CSK
1	DOOR STOP	565/522 (AS REQ.)
1	SET DOOR SEALS	5075

HEADING #10

DOORS #: M104

EACH DOOR TO HAVE:

1	CONTINUOUS HINGE	SL24HD
1	LOCKSET	MR148
1	CLOSER	7101RA
1	KICK PLATE	KP50 X B4E X CSK
1	SET DOOR SEALS	5075

HEADING #11

DOORS #: M105

EACH DOOR TO HAVE:

1	CONTINUOUS HINGE	SL18D
1	EXIT DEVICE	6201R X 629044
1	CLOSER	7101DSHO
2	CYLINDERS	TO MATCH NEW SYSTEM
1	PULL	M39-1D X 9HD MTG.
1	KICK PLATE	KP50 X B4E X CSK
1	THRESHOLD	513
1	SET DOOR SEALS	155S
1	DOOR BOTTOM SEAL	200S

HEADING #12

DOORS #: M107B

CASED OPENING

HEADING #13

DOORS #: M109A

EACH DOOR TO HAVE:

1	CONTINUOUS HINGE	SL11D
1	EXIT DEVICE	6212R X 629044
1	CLOSER	7101DSHO
2	CYLINDERS	TO MATCH NEW SYSTEM
1	PULL	M39-1D X 9HD MTG.
1	THRESHOLD	513
1	SET DOOR SEALS	BY DOOR MANUFACTURER
1	DOOR BOTTOM SEAL	200S

NOTE: PROVIDE CLOSER ADAPTOR PLATES AS REQUIRED.

HEADING #14

DOORS #: M114

EACH DOOR TO HAVE:

3	HINGES	BB81
1	PRIVACY SET	MR176
1	CLOSER	7101RA
1	KICK PLATE	KP50 X B4E X CSK
1	DOOR STOP	565/522 (AS REQ.)
1	COAT HOOK	604

HEADING #15

DOORS #: M115

EACH DOOR TO HAVE:

3	HINGES	BB81
1	LOCKSET	MR148
1	DOOR STOP	565/522 (AS REQ.)

HEADING #16

DOORS #: S101, S103A, S104

EACH DOOR TO HAVE:

3	HINGES	4B51
1	LOCKSET	MR117
1	CLOSER	7101RA
1	OVERHEAD STOP	4424 (@ S103A)
1	KICK PLATE	KP50 X B4E X CSK
1	DOOR STOP	565/522 (AS REQ. @ S101, S104)
1	THRESHOLD	425
1	SET DOOR SEALS	155S
1	DOOR BOTTOM SEAL	200S

END OF SECTION

SECTION 08 8000

GLAZING

PART 1 - GENERAL

1.1 SUMMARY:

- A. Related work:
 - 1. Joint sealants.
 - 2. Aluminum-framed entrances and storefronts.

1.2 PERFORMANCE REQUIREMENTS:

- A. Delegated design: Engage a professional engineer registered in the state of Georgia, to design glazing.
- B. Performance requirements:
 - 1. Wind loads: Comply with wind load criteria specified in Aluminum-Framed Entrances and Storefronts section.
 - 2. Thermal insulated units: Units shall comply with the requirements of ASTM E2190-10 and be certified by Associated Laboratories, Inc., (ALI) or Insulating Glass Certification Council (IGCC) for Class A.
 - 3. Tempered and heat-treated glass:
 - a. Glazing materials, whether in monolithic state or as a lite of a thermal insulated unit, shall be tempered or otherwise heat-treated where required by glass manufacturer's design calculations to resist stress caused by glass orientations, sizes and configurations, heat stress, inherent imperfections, wind loading, glazing conditions, temperature differential, inside window treatments or other conditions affecting breakage probability.
 - b. Orient lites with roll distortion parallel to head and sill members.
 - c. Maximum allowable breakage probability at design loads shall be eight lites per thousand for vertical glazing.
 - 4. Safety glazing: Tempered glazing materials shall comply with safety glazing requirements of CPSC 16-CFR, Part 1201, Category II, with testing requirements of ASTM C1048-12, and with code requirements for locations of safety glazing.
 - 5. Performance characteristics: Meet energy code requirements.

1.3 SUBMITTALS:

- A. Samples: Submit minimum 1'-0" by 1'-0" samples of each type glazing material proposed for use, if requested by Architect.
- B. Product data: Submit for each type of glazing material and accessory product specified. Include technical data, storage and handling procedures and performance characteristics.
- C. Framing manufacturer's approval: Prior to submission of shop drawings, indicate by letter that an authorized representative of storefront framing manufacturer has reviewed and approved details, including glass bite, clearances and glazing methods.

- D. Calculations: Submit for Architect's information only.
 - 1. Submit calculations prepared by glazing material manufacturer indicating recommendations for glass thickness and heat treating of glazing materials as a result of heat stress, building orientation, inside window treatments, shading by exterior building components or wind loading.
 - 2. Identify factors affecting breakage probability which have been taken into consideration and breakage probability anticipated by calculations.
- E. Maintenance data: Submit glazing material manufacturer's maintenance data for cleaning and care of each type of glazing material.
- F. Delegated-design submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the registered professional engineer responsible for their preparation.

1.4 QUALITY ASSURANCE:

- A. Applicable standards:
 - 1. American National Standards Institute (ANSI), "Safety Performance Standards and Methods of Tests for Safety Glazing Materials used in Buildings," Z97.1.
 - 2. ASTM International (ASTM), standards as referenced herein.
 - 3. Consumer Product Safety Commission (CPSC), "Safety Standard for Architectural Glazing Materials," 16-CFR, Chapter II, Part 1201.
 - 4. Glass Association of North America (GANA) "Glazing Manual".
- B. Labeling. Safety glazing: Permanently mark safety glazing with a certification label of a certifying agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Pre-glazing conference:
 - 1. Prior to beginning glass and glazing work, a preglazing conference will be held to review work to be accomplished.
 - 2. Contractor, Architect, storefront supplier and erector, a representative of glass manufacturer, a representative of sealant manufacturer and glazing subcontractor will be present.
 - 3. Contractor shall notify all parties at least seven days prior to time of conference.
 - 4. Material submitted by Contractor, interfacing of glass and glazing and window wall work, dimensions and tolerances, sealant joint widths and depths shall be reviewed.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Store glazing materials indoors in cool, dry area, off floor, supported to prevent stress and breakage.
- B. Move no cases which have been partially unpacked. Unpack glazing materials in accord with manufacturer's product data for type of material being handled. Stack individual lites as recommended by manufacturer's product data.
- C. Utilize rolling blocks to rotate glazing materials.
- D. Handle insulated units without rotating, warping or "cartwheeling" units. Prevent damage to glazing material or edge seal.

1.6 WARRANTIES:

- A. Thermal insulated units: Warrant from failure due to loss of edge seal for a period of ten years, beginning at Date of Substantial Completion.
- B. Glass replacement warranty: Include a two-year warranty covering glazing materials and labor to replace glazing damaged for any reason other than natural disasters, vandalism or damage resulting from accident or abuse arising out of Owner's operations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Acceptable float glass manufacturers; subject to compliance with specified requirements:
 - 1. AGC Flat Glass North America.
 - 2. Guardian Industries Corp.
 - 3. Nippon Sheet Glass Co., Ltd., Pilkington.
 - 4. PPG Industries, Inc./Glass Group.
- B. Acceptable glass unit fabricators; subject to compliance with specified requirements:
 - 1. Oldcastle Building Envelope.
 - 2. Trulite Glass & Aluminum Solutions (formerly Arch Aluminum and Glass and Vitro America.)
 - 3. Viracon, Inc.
- C. Acceptable low-emissivity (Low-E) glass fabricators; subject to compliance with specified requirements:
 - 1. AGC Flat Glass North America.
 - 2. Guardian Industries Corp.
 - 3. Nippon Sheet Glass Co., Ltd. Pilkington.
 - 4. Oldcastle Building Envelope.
 - 5. PPG Industries, Inc./Glass Group.
 - 6. Viracon, Inc.

2.2 GLAZING MATERIALS:

- A. General flat glass standard: Comply with ASTM C1036-11 as follows:
 - 1. Transparent flat glass, clear: Type I, Class 1-Clear, Quality - Q3.
- B. Tempered monolithic glass: 1/4" thickness, fully tempered, complying with ASTM C1048-12.
- C. Thermal insulated units:
 - 1. Tempered units:
 - a. Inboard lite: Clear color, tempered float glass; 1/4" thickness.
 - b. Outboard lite: Clear color, tempered float glass; 1/4" thickness. Provide Low-E coating on #2 surface.
 - c. Unit thickness: 1" minimum.

2.3 GLAZING SEALANTS:

A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Sealant shall have a VOC content of 250 g/L or less.

2.4 GLAZING ACCESSORIES:

- A. Setting blocks: Neoprene, 70-90 Shore A durometer hardness, meeting ASTM C864-05(2011).
- B. Edge blocks: Neoprene, 60-70 Shore A durometer hardness, meeting ASTM C864-05(2011).
- C. Spacers: Neoprene, 40-50 Shore A durometer hardness, meeting ASTM C864-05(2011).
- D. Glazing gaskets: Premium quality sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers. Gaskets shall be as recommended by framing system manufacturer to meet specified framing system performance criteria and framing system warranty requirements.
 1. Dense compression gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
 - a. Neoprene complying with ASTM C864-05(2011).
 - b. EPDM complying with ASTM C864-05(2011).
 - c. Silicone complying with ASTM C1115-06(2011).
 - d. Thermoplastic polyolefin rubber complying with ASTM C1115-06(2011).
 2. Soft compression gaskets:
 - a. Type: Extruded or molded, closed-cell, integral-skinned neoprene, EPDM, silicone or thermoplastic polyolefin rubber gaskets complying with ASTM C509-06(2011), Type II, black; of profile and hardness required to maintain watertight seal.
 - b. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.
 3. Gasket reglets: Extruded black rigid polyvinyl chloride.
- E. Polyvinyl chloride foam tape for interior glazing: Closed cell self-adhesive tape meeting ASTM D1667-05(2011).

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Verify compliance with the following requirements prior to beginning glazing work:
 - 1. That framing is anchored in position, plumb and square within 1/8" of nominal dimensions indicated.
 - 2. That fastener heads, and other projections are removed from glazing rabbets.
 - 3. That corners and fabrication intersections are sealed and framing is weathertight.
 - 4. That rabbets at sills weep to outside and rabbets are of sufficient depth and width to receive glazing material and provide the required bite of the glazing material.
 - 5. That hollow metal frames have received paint finish in accord with Painting and Coating section.

3.2 PERFORMANCE REQUIREMENTS:

- A. Install glazing materials to obtain airtight and watertight installation and to withstand normal temperature changes and wind loads without failure.
- B. Protect glazing material faces and edges during handling and installation.
- C. Size glazing materials for each opening to ensure correct bite on glazing material, without imposing strain, in accord with manufacturer's product data.
- D. Maintain minimum bed clearance between glazing material and sash of 1/8", both sides, except where greater clearance is required by either glazing material or framing manufacturer.

3.3 PREPARATION OF SURFACES:

- A. Clean glass edges and framing glazing channel of debris and protective coatings immediately prior to glazing. Use material acceptable to framing, glazing material and glazing sealant manufacturers.
- B. Inspect glazing material prior to installation. Eliminate lites having face or edge damage.
- C. Lites of tempered and insulated glass shall not be cut or otherwise altered in the field.

3.4 GLAZING PROCEDURES:

- A. Install glazing materials in accord with manufacturer's product data and applicable standards, except where more stringent requirements are specified.
- B. Install setting blocks for glazing materials over six sq. ft. in area. Install at sill rabbet at quarter points. Size setting blocks in proportion to glass weight; minimum 4" length.
- C. Shim lites over 100 united inches, inboard and outboard, on all sides using continuous shims, except where gaskets accomplish shimming.

- D. Provide edge blocks at vertical jambs to prevent lateral movement of glass. Provide edge blocks at 3" minimum length. Maintain 1/8" clearance between edge of glass and edge block.
- E. Glazing gaskets (dry): Install gaskets in accord with framing system manufacturer's installation requirements, to meet specified framing system performance criteria and framing system watertight warranty.
 - 1. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
 - 2. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place. Joints shall be miter cut and bonded together.
 - 3. Installation with drive-in wedge gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gaskets by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
 - 4. Installation with pressure-glazing stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
 - 5. Install gaskets so they protrude past face of glazing stops.
- F. Glazing sealant installation: Comply with applicable provisions of Joint Sealants section. Prevent filling of weep holes with sealant.
- G. Interior channel glazing: Glaze using polyvinyl chloride tape applied to both sides, all stops. Place tape, with butted joints. Compress tape approximately 30 percent. Center glazing material in rabbet.

3.5 PROTECTION AND CLEANING:

- A. For glazing materials subject to damage during construction, protect from breakage by attachment of crossed streamers to framing. Do not mark on surfaces.
- B. Remove and replace broken, cracked, chipped or otherwise damaged glazing materials and materials not meeting specified design criteria prior to Date of Substantial Completion.
- C. Final cleaning: Just prior to Date of Substantial Completion, clean glass inside and out. Clean using pre-tested detergent and water. Flush with clean water. Repair or replace work which cannot be cleaned or which has been damaged during construction operations.

End of Section

SECTION 08 9119

FIXED ALUMINUM LOUVERS

PART 1 - GENERAL

1.1 PERFORMANCE REQUIREMENTS:

- A. Delegated design: Design louvers, including comprehensive engineering analysis by a professional engineer registered in the state of Georgia, using structural and seismic performance requirements and design criteria indicated.
- B. Structural requirements: Design all materials to withstand wind and snow loads as required by the applicable building code. Maximum allowable deflection for the louver structural members shall be $l/180$ or 0.75 inch, whichever is less. Maximum allowable deflection for the louver blades shall be $l/120$ or 0.50 inch across the weak axis, whichever is less.

1.2 SUBMITTALS:

- A. Product data: Indicate performance test results, material types, thicknesses, finishes and sizes, fabrication and installation details.
- B. Design criteria: Submit performance data for louvers, certifying compliance with AMCA Standard 500-L, test procedures for pressure drop and water penetration performance.
- C. Shop drawings:
 - 1. Indicate louver material, design and construction, with sections, elevations and specific details. Indicate mullion locations.
 - 2. Show methods of attachment to adjacent surfaces.
 - 3. Include structural and performance calculations.
 - 4. Shop drawings and structural calculations to be signed and sealed by a professional engineer licensed to practice in the State of the project.
- D. Samples: Submit color samples for Architect's initial and final color and finish selections.
- E. Delegated-design submittal: For louvers indicated to comply with structural and seismic performance requirements, including analysis data signed and sealed by the registered professional engineer responsible for their preparation.

1.3 QUALITY ASSURANCE:

- A. Applicable standards; standards of the following, as referenced herein:
 - 1. The Air Moving and Conditioning Association (AMCA).
 - 2. Aluminum Association (AA).
 - 3. American Architectural Manufacturers Association. (AAMA).
 - 4. ASTM International (ASTM).

1.4 PROJECT/SITE CONDITIONS:

- A. Protection: Protect pre-finished surfaces from damage and staining. Provide protective covering for louvers during subsequent construction.
- B. Coordinate installation of louvers to be built into building structure. Secure templates and lay out to rough dimensions furnished by manufacturer.

1.5 WARRANTY:

- A. Finish warranty: Warrant fluoropolymer coating to remain free of checking, crazing, peeling, chalking or fading for a period of 20 years, beginning at Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LOUVERS:

- A. Acceptable manufacturers; subject to compliance with specified requirements:
1. Basis of design: Construction Specialties, Inc.
 2. Airline Louvers, a Nystrom Building Products Company.
 3. Airlite Corp./Greenheck Corp.
 4. All-Lite Architectural Products Div./PCI Industries.
 5. American Warming & Ventilating, Inc.
 6. Dowco Products Group.
 7. Greenheck Corp.
 8. Industrial Louvers, Inc.
 9. Ruskin Co.
- B. Basis of design: Construction Specialties Storm Resistant Fixed Horizontal Louver RS-4300 inverted "V" shaped, fixed horizontal blades, 4" deep.
1. Certification: AMCA certified, meeting AMCA 511, minimum 95% effective when tested with a 29 mph wind velocity and 3"/hour rainfall rate.
 2. Material: 6063-T5 or 6063-T6 aluminum alloy, meeting ASTM B221-14, 0.075" minimum thickness.
 3. Free area: Minimum 46%.
- C. Finish on exposed aluminum components:
1. Provide one of the following finishes:
 - a. Two coat, shop-applied, baked-on, fluoropolymer coating system based on minimum 70% Arkema Group, Kynar 500 or Solvay Solexis, Inc., Hylar 5000 resin (Polyvinylidene fluoride, PVDF), formulated by a licensed manufacturer and applied by manufacturer's approved applicator to meet AAMA 2605.
 - b. Powder coating: Shop-applied 1.5 to 3 mil thickness full strength 100% resin fluoropolymer powder coating meeting AAMA 2605, with a 4H hardness rating. Finish shall allow zero VOCs to be emitted into facility of application.
 2. Color: As selected by Architect from manufacturer's full range.
 3. Unexposed aluminum components: Mill finish.
- D. Screening: Bird screen in extruded aluminum frame.
- E. Mullions: Provide as indicated on approved shop drawings, of same material and finish as louvers.
- F. Sill pieces: Form of same material and finish as louvers.
- G. Blank-off panels: 0.050" thickness aluminum sheet, finished to match louvers.

- H. Accessory products:
 - 1. Fasteners: Stainless steel of type required to attach to substrates encountered.
 - 2. Bituminous paint: Cold-applied asphalt emulsion for separation of dissimilar materials complying with ASTM D1187-97(2011), minimum 30 mils dry film thickness per coat.
- I. Fabrication:
 - 1. Provide louvers, bird screens, blank-off panels, structural supports and accessories as specified and/or shown on approved shop drawings. Materials, sizes, depths, arrangements and material thickness shall be as indicated or as required for optimal performance with respect to strength; durability; and uniform appearance.
 - 2. Louvers shall be mechanically assembled using stainless steel or aluminum fasteners.
 - 3. Include supports, anchorage, and accessories required for complete assembly.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Coordination:
 - 1. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.
 - 2. Coordinate weather resistant elements at exterior louvers.
 - 3. Coordinate size and location of blankoff panels with mechanical duct locations.

3.2 INSTALLATION:

- A. Install louvers plumb, level and true, in accord with manufacturer's installation instructions, approved shop drawings and product data, in prepared openings. Attach louvers using stainless steel fasteners at head, sill and jambs, with fasteners spaced as shown on shop drawings.
- B. Louvers:
 - 1. Verify dimensions of supporting structure at the site by accurate field measurements so that the work will be accurately designed, fabricated and fitted to the structure.
 - 2. Anchor louvers to the building substructure as indicated on architectural drawings.
 - 3. Erection Tolerances:
 - a. Maximum variation from plane or location shown on the approved shop drawings: 1/8" per 12 feet of length, but not exceeding 1/2" in any total building length or portion thereof (non-cumulative).
 - b. Maximum offset from true alignment between two members abutting end to end, edge-to edge in line or separated by less than 3": 1/16" (shop or field joints). This limiting condition shall prevail under both load and no load conditions.
 - 4. Cut and trim component parts during erection only with the approval of the manufacturer or fabricator, and in accordance with his recommendations. Restore finish completely. Remove and replace members where cutting and trimming has impaired the strength or appearance of the assembly.

5. Do not erect warped, bowed, deformed or otherwise damaged or defaced members. Remove and replace any members damaged in the erection process as directed.
 6. Set units level, plumb and true to line, with uniform joints.
- C. Separate aluminum from dissimilar metals, concrete, stucco and masonry using minimum 30 mils dry film thickness bituminous paint.

End of Section

SECTION 09 2900

GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY:

- A. Related work:
 - 1. Rough carpentry.
 - 2. Architectural woodwork.
 - 3. Tiling.
 - 4. Acoustical ceilings.
 - 5. Painting and coating.
 - 6. Mechanical.
 - 7. Electrical.

1.2 SUBMITTALS:

- A. Product data: Indicate product description, including compliance with specified requirements and installation requirements. Include specific requirements for fire-rated and acoustically rated partitions. Mark manufacturer's brochures to include only those products proposed for use. Include details for supplementary fire protection at penetrations and locations of acoustical sealant.
- B. Evaluation reports: For embossed steel studs and runners and firestop tracks, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.3 QUALITY ASSURANCE:

- A. Applicable standards; standards of the following:
 - 1. American National Standards Institute (ANSI).
 - 2. ASTM International (ASTM) as referenced herein.
 - 3. Association of the Wall and Ceiling Industries - International (AWCI).
 - 4. Ceilings and Interior Systems Construction Association (CISCA).
 - 5. Gypsum Association (GA).
 - 6. Steel Stud Manufacturers Association (SSMA).
 - 7. Underwriters Laboratories, Inc. (UL).
 - 8. Intertek Testing Services/Warnock Hersey, Inc. (WHI).
 - 9. "Recommended Specification: Levels of Gypsum Board Finish" as published jointly by the Gypsum Association, AWCI, CISCA and PDCA.
 - 10. Painting and Decorating Contractors of America (PDCA).
- B. Design criteria:
 - 1. Sound rating: Construct designated partitions in accord with manufacturer's product data, as submitted, for obtaining Sound Transmission Class (STC) ratings as indicated on drawings, in accord with ASTM E90-09.
 - 2. Fire-resistance: Comply with fire-resistance designs indicated on drawings. Use only manufacturers and types of materials as required by indicated designs. Designs with tests by other than Testing Agency listed may be submitted for Architect's acceptance, subject to prior acceptance by governing authorities.
 - 3. Seismic performance: Comply with code requirements.

- C. Preinstallation meetings:
 - 1. Conduct meetings at project site with Architect, Contractor, gypsum board installer and installers of other related products in attendance.
 - 2. Review details of gypsum board installation, including finishing of gypsum board and location of control joints.

- D. Jobsite mock-up:
 - 1. Provide mockups for appearance areas finished to a Level 3, or 4 as described herein.
 - 2. Mock-ups shall be minimum of at least 100 sq. ft.in surface areaand shall represent the requirements found in the specified Level of Finish, the location within the building, and shall include texture and/or other decorative finishes such a final paint, wall covering, trim, or other wall treatments.
 - 3. Mockups shall demonstrate aesthetic effects and set quality standards for materials and execution.
 - 4. Build mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each texture finish indicated.
 - 5. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 - 6. Simulate finished lighting conditions for review of mockups.
 - 7. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at date of Substantial Completion.

1.4 DELIVERY, STORAGE AND HANDLING:

- A. Delivery: Deliver materials in original packages, containers or bundles bearing brand name, applicable standard designation and name of manufacturer or supplier.

- B. Storage:
 - 1. Stack gypsum board inside building under roof, off floor on pallets or similar platforms providing continuous support for gypsum board and to prevent sagging. Stack gypsum board flat and so that long lengths are not over short lengths.
 - 2. Protect gypsum board from direct exposure to rain, snow, sunlight or other excessive weather conditions.
 - 3. Protect ready-mixed joint compounds against freezing, exposure to extreme heat and direct sunlight at all times.
 - 4. Do not overload floor systems.

1.5 PROJECT/SITE CONDITIONS:

- A. Do not install gypsum board until installation areas are enclosed.

- B. Environmental limitations: Comply with ASTM C840-13 requirements and gypsum board manufacturer's written recommendations, whichever are more stringent.
 - 1. During mechanical application of gypsum board, maintain room temperature at not less than 40 degree F.
 - 2. During joint treatment and decoration, maintain room temperature not less than 50 degrees F for 48 hours prior to application and continuously thereafter until completely dry and until permanent heating system is in operation or building is occupied.

3. When temporary heat source is used, temperature shall not exceed 95 degree F in any given room or area.
- C. Do not install boards that are wet, those that are moisture damaged, and those that are mold damaged.
 1. Indications that boards are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that boards are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.
- D. Ventilation: Comply with ASTM C840-13 requirements and gypsum board manufacturer's written recommendations, whichever are more stringent.
 1. Provide ventilation during and following joint treatment applications, and drying and curing periods.
 2. Use temporary air circulators in enclosed areas lacking natural ventilation.
 3. Under slow drying conditions, allow additional drying time between coats of joint treatment.
 4. Protect installed materials from drafts during hot, dry weather.
- E. When recommendations of manufacturer's product data exceed the above, comply with requirements of manufacturer's product data.

PART 2 - PRODUCTS

2.1 FRAMING MEMBERS:

- A. Gypsum board studs: Meeting requirements of ASTM C645-14; channel type, roll-formed from hot dip galvanized steel only; complying with ASTM A1003-15 and with ASTM A653-13, G40 minimum. No EQ coatings permitted.
 1. Stud size: As indicated on drawings, except minimum 3-5/8" depth where partition is indicated to receive tile finish.
 2. Stud gauge: As required by manufacturer's product data and ASTM C754-15 for limiting heights, structural determinations, and conditions of use, with maximum allowable deflections as follows:
 - a. Ground floor lobbies, excluding those with tile finishes:
 - 1) Non-structural studs: Minimum L/120 at 10 psf in accord with ASTM C645-14.
 - 2) Structural studs: Minimum L/120 at 20 psf in accord with ASTM C955-11c.
 - b. Partitions to receive tile finishes:
 - 1) Non-structural studs: Minimum L/360 at 10 psf using 20 ga. or heavier studs, in accord with ANSI A108.11 and ASTM C645-14.
 - 2) Structural studs: Minimum L/360 at 20 psf using 20 ga. or heavier studs, in accord with ANSI A108.11 and ASTM C955-11c.
 - c. Other partitions: Meet code requirements.
 3. Comply with submitted design calculations.
- B. Floor and ceiling runners: Hot dip galvanized steel, minimum 1" deep, same width as studs, same gauge as studs. Runner tracks shall have slotted holes for attachment to structure and studs, for slip joints where required by manufacturer's product data.

- C. Deflection tracks: Minimum 20 gauge hot dip galvanized steel, deep leg type with slotted flange width of 2-1/2" minimum, allowing vertical movement of up to 1-1/2". Track shall be same nominal depth as studs with allowance for deflection of standard deep leg track.

2.2 GYPSUM BOARD:

- A. Mold and moisture resistant board: Treated paper-faced gypsum board.
 - 1. Acceptable products:
 - a. American Gypsum, M-Bloc Type X Gypsum Board.
 - b. Continental Building Products, Mold Defense Type X.
 - c. CertainTeed, M2Tech Moisture & Mold Resistant Gypsum Board.
 - d. Georgia-Pacific, ToughRock Fireguard X Mold-Guard Gypsum Board.
 - e. National Gypsum, XP Fire-Shield Gypsum Board.
 - f. USG Corporation, USG Sheetrock Brand Mold Tough.
 - 2. Thickness: 5/8" thickness Type X Grade fire-rated board, tapered edges.
 - 3. Description: Mold and moisture resistant gypsum core encased in mold and moisture resistant facers, with tapered long edges. Panels shall comply with ASTM C1396-14a.
 - 4. Mold resistance: Resistant to mold growth when tested in accord with ASTM D3273-12, score of 10.
 - 5. Water absorption: Less than 5% of board weight when tested in accord with ASTM C473-12.
 - 6. Joint tape: As recommended by gypsum board manufacturer.
 - 7. Limitations: Do not use as a tile backer board.
- B. Regular board: Meeting ASTM C1396-14a, 5/8" thickness, tapered rounded edges.
- C. Fire-retardant board: Meeting ASTM C1396-14a, Type X, 5/8" tapered rounded edges.

2.3 SOUND CONTROL MATERIALS:

- A. Contractor's option: Based on sound ratings and fire-resistance ratings required for assemblies, Contractor may select glass fiber or mineral wool sound attenuation materials as follows:
 - 1. Glass fiber sound attenuation batts:
 - a. Acceptable manufacturers:
 - 1) CertainTeed Corp.
 - 2) Knauf Insulation.
 - 3) Johns Manville Corp.
 - 4) Owens-Corning Corp.
 - b. Characteristics:
 - 1) Type: Unfaced fiberglass batts for friction fit between studs, complying with ASTM C665-15, Type 1.
 - 2) Surface burning characteristics: Maximum 25 flame spread and 50 smoke development when tested in accord with ASTM E84-15.
 - 3) Assembly STC: As indicated on drawings.
 - 4) Thickness: As indicated on drawings.
 - 2. Mineral wool sound attenuation blankets:
 - a. Acceptable manufacturers:
 - 1) IIG, MinWool, LLC, MinWool Sound Attenuation Fire Batt.
 - 2) Owens-Corning Corp., Sound Attenuation Fire Batt.
 - 3) USG Corporation, Thermafiber SAFB (Sound Attenuation Fire Blankets).

- b. Characteristics:
 - 1) Type: Paperless, semi-rigid mineral wool fiber blanket complying with ASTM C665-15, Type 1.
 - 2) Density: Maximum 4.0 pcf for 1" thickness, and maximum 2.5 pcf. for greater thicknesses.
 - 3) Surface burning characteristics: Maximum 15 flame spread and 5 smoke development when tested in accord with ASTM E84-15.
 - 4) Assembly STC: As indicated on drawings.
 - 5) Thickness: As indicated on drawings.
- B. Acoustical tape: Closed cell polyvinyl chloride foam tape, 1/4" thickness by 1" wide.
- C. Acoustical Joint Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C834-14. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90-09.
 - 1. Acceptable products:
 - a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
 - b. Grabber Construction Products; Acoustical Sealant GSC.
 - c. Pecora Corporation; AC-20 FTR and AIS-919.
 - d. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
 - e. USG Corporation; USG Sheetrock Brand Acoustical Sealant.
 - 2. Sealant shall have a VOC content of 250 g/L or less.

2.4 FASTENERS:

- A. Expansion anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488/E 488M conducted by a qualified testing agency.
- B. Power-actuated anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- C. Fasteners for metal framing, corrosion-resistant:
 - 1. For fastening framing members to concrete and masonry surfaces: Fasteners shall be beaded drive pins or threaded studs driven by powder actuated tools. Fasteners shall resist design loads in accord with requirements of ASTM E1190-11.
 - 2. For fastening to metal decking and for fastening framing members together: Type S, pan head screws, in sizes recommended by gypsum board manufacturer for applications indicated.
 - 3. Provide slotted, stand-off washers for slip joint attachments.
- D. Screws for gypsum board and accessory application: Meeting ASTM C1002-14, corrosion-resistant.
 - 1. For application of single layer or base layer of gypsum board to metal framing: 1", Type S, bugle head.
 - 2. For application of face layer of gypsum board to metal framing in double layer construction: 1-5/8", Type S, bugle head.
 - 3. For gypsum board to gypsum board application: 1-1/2", Type G, bugle head.

4. For application of single layer and base layer of gypsum board to wood framing: 1-1/4", Type W, bugle head.

2.5 JOINT MATERIALS:

- A. Standard gypsum board products:
 1. Joint tape: Meeting ASTM C475-12, perforated paper type.
 2. Joint compound: Meeting ASTM C475-12, ready-mixed tape embedment and topping compounds, vinyl-based.
- B. Mold and moisture resistant paper faced gypsum board: Joint tape and joint compound shall be in accord with recommendations of board manufacturer's product data.

2.6 SUSPENDED GYPSUM BOARD FURRING SYSTEM:

- A. Acceptable manufacturers:
 1. Armstrong World Industries, Inc.
 2. Chicago Metallic Corp.
 3. USG Corporation.
- B. Characteristics:
 1. Structural classification: Meeting ASTM C635-13a, Heavy Duty.
 2. Components: Fabricated from minimum 0.018" base metal thickness, galvanized, cold-rolled steel; double web design.

2.7 INSTALLATION ACCESSORIES:

- A. Accessories shall comply with ASTM C1047-14a and shall be as follows.
- B. Furring channels: Minimum 25 ga. galvanized steel, 7/8" deep by 1-3/8" face width.
- C. Resilient channel: Galvanized steel, manufacturer's standard type.
- D. Furring brackets: Minimum 20 ga. galvanized steel, for attaching 3/4" furring channels to masonry walls.
- E. Ceiling hangers: Minimum eight ga. galvanized annealed steel wire.
- F. Tie wire: Minimum 18 ga. galvanized, annealed steel wire.

2.8 TRIM ACCESSORIES:

- A. One of the following:
 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
 2. Approved plastic trim manufacturers:
 - a. Plastic Components, Inc.
 - b. Trim-TEEx Drywall components.
 - c. Vinyl corp.
- B. Accessories shall comply with ASTM C1047-14a and ASTM D3678-14.
- C. Corner beads: 1-1/4" wide perforated flanges.

- D. Jamb, ceiling and casing trim: Manufacturer's standard "L" and "U" shaped members with expanded metal or perforated flanges; "mud-in" type for finishing with joint compound.
- E. Control joints: Control joint shall be designed to be applied after wallboard is installed. Expanded metal or perforated flanges shall accept joint compound for a flush finish. Control joints shall provide stress relief and shall assist in controlling cracking in large areas of wallboard.

PART 3 - EXECUTION

3.1 FRAMING AND FURRING INSTALLATION:

- A. Except where more stringent requirements are specified, install framing and furring in accord with ASTM C754-15, Gypsum Association requirements and manufacturer's product data.
- B. Runners:
 - 1. Attach runner tracks at floor and underside of structural deck with specified fasteners. Provide slip joint attachments to meet deflection criteria and manufacturer's calculations at the following locations:
 - a. Tall partitions.
 - b. Full-height, floor-to-floor or floor-to-deck partitions.
 - c. All partitions subject to deflection.
 - 2. Where partitions are indicated to stop at finish ceiling, attach to ceiling suspension system using 1/8" toggle bolts or sheet metal screws spaced at 1'-4" o. c., maximum, where partition aligns with ceiling grid. Where partition does not align with grid, attach at each intersection with grid.
- C. Studs:
 - 1. Position full length studs vertically, engaging floor and ceiling runners.
 - a. Space studs as indicated on drawings.
 - 2. Provide double studs at interior and exterior corners, expansion joints, partition termination and adjacent to door and borrowed lite openings in partitions. Locate next stud not more than 6" from double studs.
 - 3. Secure abutting and intersecting walls with fasteners through stud flanges.
 - 4. For horizontal reinforcement at door and borrowed lite frames, install cut-to-length runner sections with slit flanges secured to studs.
 - 5. Install acoustical tape on metal studs which abut other studs or dissimilar surfaces in walls to receive sound attenuation blankets.
- D. Furring:
 - 1. Attach to masonry substrate with fasteners spaced at 2'-0" o. c. on alternating furring channel flange.
 - 2. Position channels vertically, spaced at 1'-4" o. c., maximum.

3.2 SUSPENDED GYPSUM BOARD FURRING SYSTEM INSTALLATION:

- A. Install suspension system in accord with ASTM C754-15.
- B. Seismic bracing: Comply with details and spacing indicated on drawings.
- C. Hangers:
 - 1. Space hangers at 4'-0" o. c., maximum, in each direction. Secure to building structure.

2. Install additional hangers at ends of each suspension member and at each corner of lighting fixtures.
 3. Splay wires no more than 5" in 4'-0" vertical drop.
 4. Wrap wire minimum of three times horizontally, turning ends upward.
- D. Space main tees at 4'-0" o. c., perpendicular to structure. Space cross tees at 2'-0" o. c., perpendicular to main tees to form 2'-0" by 4'-0" grid system.
- E. Level and square suspension system within specified tolerances.
- F. Where grid system exists in an unrestrained condition, brace back to building structure using hanger wire, main tee or carrying channel braces spaced at 4'-0" o. c., maximum.

3.3 GENERAL BOARD APPLICATION:

- A. Except where more stringent requirements are specified, install gypsum board in accord with ASTM C840-13, GA-216 and manufacturer's product data.
- B. Use gypsum board of maximum lengths to minimize end joints. Stagger end joints.
- C. Abut gypsum boards without forcing. Fit ends and edges of board. Do not place butt ends against tapered edges.
- D. Support ends and edges of gypsum board on framing or furring members, except for face layer of double layer work.
- E. Install gypsum board accessories in accord with gypsum board manufacturer's product data and as follows:
1. Control joints: Install in walls, ceilings and soffits at locations acceptable to Architect and as follows:
 - a. Where a wall, ceiling or soffit traverses a construction joint in the base building structure.
 - b. Where ceiling and soffit framing members change direction.
 - c. Where wall length exceeds 30 lineal feet.
 - d. Interior ceilings with perimeter relief: At maximum 50'-0" o.c. in both directions.
 - e. Interior ceilings without perimeter relief: At maximum 30'-0" o.c. in both directions.
 - f. Where approved by Architect for visual effect.
 - g. Full height wall or partition door frames may be considered a control joint.
 - h. Where control joints occur in fire rated partitions, comply with code requirements and gypsum board manufacturer's product data.
 2. Corner bead: Install at external corners.
 3. Metal trim shapes: At exposed edge of gypsum board at door and window openings, at intersections with other materials and at intersection of walls with ceilings.
 4. Install corner beads and metal trim shapes to framing system with mechanical anchors.
- F. Install acoustical sealant at sound-rated partitions:
1. Seal partition perimeter with continuous 1/4" minimum round bead of acoustical sealant applied to each leg of runners, including those used at partition intersections with dissimilar wall construction.
 2. Install gypsum board with 1/8" perimeter relief compressing sealant to form permanent airtight seal.

3. Where slip joint attachments are required at top of partition, fill resulting joint between drywall and adjacent structure with acoustical sealant to form permanent air tight seal.
 4. Apply acoustical sealant around cutouts such as at electrical boxes, plumbing penetrations, medicine cabinets, heating ducts and cold air returns to form permanent airtight seal. (Sealant shall not be used as a fire stopping material.)
- G. Install sound attenuation blankets at locations indicated on drawings. Comply with manufacturer's product data for installation. Attach flanges of blanket to web of stud and not to face of stud receiving gypsum board.
- H. For fire-rated and acoustically rated construction, comply with requirements of tested assemblies scheduled on the drawings.
- I. Continue required components of fire-rated and acoustically rated wall assembly to overhead structure. Apply joint tape and one coat of compound to gypsum board joints concealed from view in completed work.
- J. Seal openings and penetrations in fire-rated construction as specified in Firestopping section.
- K. Attach gypsum board to resilient channels with screws of length to not contact framing.
- L. Allowable tolerances in framed gypsum board construction.
1. Position: $\pm 1/4$ " maximum variation from design position.
 2. Alignment: $1/8$ " in 8'-0"; $1/4$ " maximum in any continuous wall, line or surface.
 3. Surface plane: $1/8$ " in 12'-0"; $1/16$ " in 1'-0", maximum variation in true surface plane.
 4. Surface smoothness: No joint or fastener location, roughness or blemish discernible after application of finish when viewed at any angle from a distance of 5'-0" under occupancy lighting conditions, with surface preparation as specified in Painting and Coating section.
- M. Allowable tolerances in suspended gypsum board furring system ceilings:
1. Deflection: Suspension system components, hangers and fastening devices supporting lighting fixtures, ceiling grilles and acoustical units shall have maximum deflection of $1/360$ of span when tested in accord with ASTM C635-13a.
 2. Bow, camber and twist: Not exceeding tolerances established by ASTM C635-13a.
 3. Variation from level in finished ceiling: $\pm 1/8$ " in 12'-0".
 4. Variation in plane of adjacent gypsum board panels prior to joint treatment: $1/16$ ".

3.4 SINGLE LAYER APPLICATION:

- A. Ceilings: Apply gypsum board with long dimension at right angles to framing. Terminate edges of gypsum board running parallel to framing on framing members.
- B. Walls:
1. Apply gypsum board vertically or horizontally at Contractor's option, except as required by gypsum board manufacturer's product data for system designs, including fire-rated and acoustically-rated partitions.
 2. Stagger end joints in opposite sides of partitions.

3. Terminate edges of gypsum board running parallel to framing, furring on framing or furring members.
- C. Fastening: Attach gypsum board using fasteners specified at spacings required by manufacturer's product data.

3.5 DOUBLE LAYER APPLICATION:

- A. Base layer:
1. Ceilings: Apply base layer with long dimension at right angle to framing. Terminate edges of gypsum board running parallel to framing on framing members.
 2. Walls: Apply base layer vertically. Terminate edges of gypsum board running parallel to framing, furring on framing or furring members. Stagger vertical joints on opposite sides of partitions.
 3. Fastening: Attach gypsum board using fasteners specified, at spacings required by manufacturer's product data.
- B. Face layer:
1. Apply face layer at right angle to base layer with minimum 10" offset in parallel base and face layer joints.
 2. Fastening: Attach gypsum board using fasteners specified, at spacings required by manufacturer's product data.

3.6 JOINT TREATMENT:

- A. Finish Levels shall be in accord with the "Recommended Levels of Finish for Gypsum Board, Glass Mat and Fiber-Reinforced Gypsum panels", GA-214-2015, as published jointly by the Gypsum Association, AWCI, CISCA, DFC and PDCA.
- B. Finish Level 0; temporary construction: No taping, finishing, or accessories required.
- C. Finish Level 1; joint treatment in smoke barrier applications and areas not normally open to public view such as plenum areas above ceilings, attics, and other areas where the assembly would generally be concealed:
1. Joints and interior angles shall have tape embedded in joint compound.
 2. Excess joint compound, tool marks and ridges are acceptable.
 3. Accessories are optional unless specified or indicated in the contract documents.
- D. Finish Level 2; where board products are used as a substrate in storage areas, or other similar areas where surface appearance is not a concern.
1. Joints and interior angles shall have tape embedded in joint compound and wiped with a joint knife leaving a thin coating of joint compound over joints and interior angles. Joint compound applied over the body of the tape at the time of tape embedment shall be considered a separate coat of joint compound and shall satisfy the conditions of this level.
 2. Fastener heads and accessories shall be covered with one (1) coat of joint compound.
 3. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.
- E. Finish Level 3: Not used.

- F. Finish Level 4; Appearance areas where smooth wall designs are decorated with flat paints, light textures, non-continuous textures, or where wall coverings are to be applied:
 - 1. Joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife leaving a thin coating of joint compound over joints and interior angles.
 - 2. Apply two (2) separate coats of joint compound over flat joints and apply one (1) separate coat of joint compound over interior angles.
 - 3. Cover fastener heads and accessories with three (3) separate coats of joint compound.
 - 4. Surface shall be smooth and free of tool marks and ridges.
 - 5. Jobsite mock-up(s) shall be used to determine acceptance of the finish within the building.
- G. Finish Level 5: Not used.
- H. Fastener pop: Drive new fastener approximately 1-1/2" from popped fastener and repair to match gypsum board finish.
- I. Fill cracks with joint compound and sand smooth and flush.
- J. Dust surfaces and leave ready for decoration. Joint and fastener treatment shall be indistinguishable in finished work.

End of Section

SECTION 09 3000

TILING

PART 1 - GENERAL

1.1 SUBMITTALS:

- A. Shop drawings: Submit for tile pattern work indicated. Indicate control and expansion joint locations. Include tile layout, setting bed thicknesses, joint widths, control and expansion joint sizes and sections.
- B. Product data: Submit manufacturer's printed product description and installation instructions for each type of tile and for use of manufactured mortars, grouts, adhesives, sealants, latex/polymer additives, crack isolation membrane and accessory products. Include mortar and grout proportioning and mixing instructions for latex/polymer additives.
- C. Samples; submit the following:
 - 1. 1'-0" by 1'-0" panel of each type and color tile selected, grouted as specified.
 - 2. Samples of each trim shape required.
 - 3. 1'-0" length of threshold.
 - 4. Samples of each accessory required.
 - 5. Submit samples of standard color sealant materials for Architect's approval.
- D. Master grade certificates: Indicate that materials conform to ANSI A137.1 and ANSI A137.2. Certificates shall indicate grade, kind of tile, identification for tile packages and name and location of project. Tile manufacturer shall issue certificates at time of shipping.
- E. Submit written certification that crack isolation membrane is approved for use with specified mortars.

1.2 QUALITY ASSURANCE:

- A. Applicable standards:
 - 1. Standards of the following, as referenced herein:
 - a. American National Standards Institute (ANSI).
 - b. ASTM International (ASTM).
 - c. Marble Institute of America, Version VII (MIA).
 - 2. Tile Council of North America (TCNA), "Handbook for Ceramic, Glass, and Stone Tile Installation," 2014 Edition.
- B. For each type of setting material and grouting material specified, only one brand shall be used throughout project.
- C. Allowable tolerances: Plumb, level and true to line, meeting ANSI A108.02 as follows:
 - 1. For tile with all dimensions less than 15": Maximum 1/16" in 1'-0" and maximum 1/4" in 10'-0".
 - 2. For tile with any dimension greater than 15": Maximum 1/16" in 2'-0" and maximum 1/8" in 10'-0".

1.3 DELIVERY, STORAGE AND HANDLING:

- A. Deliver materials in original containers with labels legible and intact, identifying brand name and contents.
 - 1. Tile cartons shall be grade-sealed by manufacturer in accord with ANSI A137.1 and ANSI A137.2, with grade seals unbroken.
 - 2. Manufactured mortars, adhesives and grouts shall bear hallmarks certifying compliance with specified standards.

1.4 JOB CONDITIONS:

- A. Environmental requirements: Comply with minimum temperature recommendations of manufacturers.

1.5 MAINTENANCE:

- A. Extra materials:
 - 1. Provide one carton of each type, size and color of tile specified and 5% of each type, size and color of accessory, for Owner's maintenance.
 - 2. Store tile and accessory units where indicated by Owner.

PART 2 - PRODUCTS

2.1 TILE, GENERAL:

- A. Factory blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- B. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
- C. Factory-applied temporary protective coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by pre-coating with continuous film of release agent as recommended by mortar and grout manufacturer or a hot-applied petroleum paraffin wax. Do not coat backs or sides of tile surfaces.

2.2 TILE:

- A. The basis of design for each type of tile is scheduled on drawings. Tile of similar characteristics, as manufactured by other acceptable manufacturers, may be submitted for Architect's acceptance. Acceptance is subject to compliance with specified requirements, as evidenced by specified submittals.
- B. Acceptable manufacturers; porcelain tile:
 - 1. American Marazzi Tile, Inc.
 - 2. American Olean/Dal-Tile Co.
 - 3. Buchtal Corp., U.S.A.
 - 4. Crossville Ceramics.
 - 5. Dal-Tile Corp.
 - 6. Florim USA.
 - 7. Florgres.
 - 8. GranitiFiandre, Trans Ceramic Ltd.
 - 9. Interceramic, USA.
 - 10. R.A.K. Ceramics.
 - 11. Roca Tile Group, Unites States Ceramic Tile Co.
- C. Porcelain tile:

1. Meeting ANSI A137.1, Section 4.1 Impervious Class, and Section 6.1 Table 10, Standard Grade.
2. Color: As selected by Architect from manufacturer's full range.
3. Nominal face size: As scheduled on drawings.
4. Thickness: Minimum 3/8".
5. Finish: As scheduled on drawings.
6. Dynamic coefficient of friction (DCOF) for floor tile:
 - a. Tested in accord with the DCOF AccuTest, and meeting ANSI A137.1 and recommendations of ADA Accessibility Guidelines.
 - b. DCOF minimum: 0.42.
7. Trim shapes: Matching tile in color and size. Include coved base, coved bullnose base, bullnose caps, beads and corner units, as required.

2.3 SETTING MATERIALS AND ACCESSORIES:

- A. Premium latex-modified thinset mortar for floor tile with all dimensions less than 15":
 1. Acceptable products:
 - a. Bonsal American, ProSpec Superior Permaset 400.
 - b. Bostik, Tile-Mate Premium.
 - c. Custom Building Products, Flexbond Premium Flexible Bonding Mortar.
 - d. Mapei Corp., Kerabond/Keralastic System.
 2. Characteristics: Pre-sanded, latex/polymer-modified or polymer-modified Portland cement and additives meeting ANSI A118.4.
- B. Medium bed latex Portland cement mortar for floor tile with any dimension 15" or larger:
 1. Acceptable products:
 - a. Bonsal American, ProSpec Medium Bed Permaflex 550.
 - b. Bostik, Big Tile & Stone Mortar.
 - c. Custom Building Products, MegaLite Crack Prevention Mortar.
 - d. Mapei Corp., Ultralite Mortar.
 2. Characteristics: Pre-sanded, latex/polymer-modified Portland cement and additives meeting ANSI A118.15, minimum 400 psi shear strength.
- C. Premium latex-modified thinset mortar for wall base tile:
 1. Acceptable products:
 - a. Bonsal American, ProSpec Superior Permaset 400.
 - b. Bostik, Tile-Mate Premium.
 - c. Custom Building Products, MegaLite Crack Prevention Mortar.
 - d. Mapei Corp., Kerabond/Keralastic System.
 2. Characteristics: Pre-sanded, latex/polymer-modified Portland cement and additives meeting ANSI A118.15, minimum 400 psi shear strength, non-sag.
- D. Crack isolation membrane:
 1. Acceptable products:
 - a. The Noble Co., Noble Seal CIS.
 - b. Comotite Corporation, Composeal Gold.
 - c. Custom Building Products, Crack Buster Pro.
 - d. NAC Products, Inc., ECB Membrane.
 2. Characteristics:
 - a. Material: Minimum 30 mil thickness fiber/fabric-reinforced elastomeric membrane meeting ANSI A118.12 High Performance.

- b. Primer, adhesive and accessories: As recommended by membrane manufacturer's product data with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 GROUTING MATERIALS:

- A. Epoxy grout for all floor tile and for wall base tile:
 1. Acceptable products:
 - a. Bonsal American, ProSpec B-7000 Epoxy Mortar & Grout.
 - b. Bostik Findley, Color-Poxy.
 - c. Custom Building Products, CEG-Lite 100% Solids Commercial Epoxy Grout.
 - d. Mapei Corp., Kerapoxy.
 2. Characteristics: 100% epoxy, two-part or three-part composition meeting ANSI A118.3, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D; standard colors selected by Architect.
 3. Grout release agent: Provide grout manufacturer's recommended grout release agent, for application prior to grouting tile to receive epoxy grout.

2.5 ADDITIVES:

- A. Latex/polymer additives: Integral polymer additives or undiluted additives for field mixing. Additives shall be manufactured by or approved in writing by mortar and grout manufacturers.
- B. Proportioning and mixing: Comply with mortar and grout manufacturers' product data for additive proportions and mixing instructions.

2.6 CONTROL AND EXPANSION JOINT MATERIALS:

- A. Acceptable products:
 1. Pecora Corp., Dynatrol II.
 2. BASF Building Systems, MasterSeal NP-2.
 3. Custom Building Products, 100% Silicone Caulk.
 4. Tremco, Inc., Dymeric.
- B. Characteristics:
 1. Type; Contractor's option:
 - a. Urethane: Two-part, polyurethane-based sealant with separate pre-packaged color agent; VOC Content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - b. Silicone: One-part silicone caulk meeting ASTM C920-14, Shore A Hardness of 35+, Type S, Grade NS, Class 25, Use T, I, M & G and ASTM C794-10 properties.
 2. Colors: Colors as selected by Architect from manufacturer's full range.
- C. Primer: Types recommended by sealant manufacturer:
 1. Sealant primers for nonporous substrates: 250 g/L.
 2. Sealant primers for porous substrates: 775 g/L.
- D. Backup material: Flexible, non-compressive foam type as recommended by sealant manufacturer.

2.7 ACCESSORY MATERIALS:

- A. Marble thresholds: Meeting MIA Group A, honed finish, in sizes and shapes indicated; types and colors as selected by Architect.
- B. Cleaning materials and methods for face of epoxy-grouted tile: Provide grout cleaning materials and methods in accord with manufacturer's product data.
- C. Grout sealer: Manufacturer's standard grout sealer which does not change color or appearance of grout. Subject to compliance with requirements of this specification, provide named products and systems or comparable products and systems by one of following manufacturers:
 - 1. Acceptable products:
 - a. Bostik Findley; "CeramaSeal Magic Seal™ Grout Sealer".
 - b. Custom Building Products; "TileLab SurfaceGard Penetrating Sealer".
 - c. Southern Grouts & Mortars, Inc; "Grout Sealer-Premium Stain Blocker".
 - d. Summitville Tiles, Inc.; "SL-99 SummitSeal II".
- D. Leveling compound; acceptable products:
 - 1. Custom Building Products, LevelQuik RS.
 - 2. Euclid Chemical Co., Super Flo-Top.
 - 3. Mapei, Ultraplan 1 Plus.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION:

- A. Subfloor curing:
 - 1. Concrete subfloors shall be moisture-cured or cured using a curing compound in accord with the requirements of the Concrete Finishing section.
 - 2. If a curing compound has been used, Contractor shall verify that compound is compatible with flooring manufacturer's installation materials.
 - 3. If the curing compound is not compatible, or if compatibility is unknown, Contractor shall remove curing compound by shot-blasting or other methods approved by floor finish manufacturer.
- B. Concrete moisture vapor emission, humidity levels and pH testing: Perform one or more of the following tests, as required by flooring manufacturer's product data, using the following methods:
 - 1. Moisture vapor emissions: Perform tests on subfloors in accord with ASTM F1869-11 calcium chloride test and flooring manufacturer's product data, to determine if surfaces are acceptable to receive specified flooring products.
 - 2. Humidity level: Perform on subfloors in accord with ASTM F2170-11 *in situ* probe and flooring manufacturer's product data, to determine if surfaces are acceptable to receive specified flooring products.
 - 3. Concrete pH level: Perform on subfloors to verify that surfaces are acceptable to receive specified flooring products.
 - 4. Correction of conditions: Prior to installation, correct conditions that do not meet flooring manufacture's requirements, or that may be detrimental to flooring installation.

- C. Leveling compound:
1. Acceptable substrates: Concrete shall be fully cured, scarified, and shall accept water penetration. Test by sprinkling water on various areas of the substrate.
 - a. If water penetrates, then a good bond can be achieved.
 - b. If water beads, surface contaminants are present, and loss of adhesion may occur. Contaminants should be mechanically removed before installation.
 - c. Concrete be free of efflorescence and not subject to hydrostatic pressure. Concrete slabs should have a broomed or brushed finish to enhance the bond. Smooth concrete slabs must be mechanically abraded to ensure a good bond.
 2. Installation:
 - a. Priming: Apply primer in accord with manufacturer's installation instructions.
 - b. Leveling compound: Pour or pump, and then spread with a long-handled gauged spreader. Leveling compound will seek its own level during the first 10 minutes.
 - 1) For feather edging and touch up, use a smoothing tool.
 - 2) Leveling compound can be applied to 1" (2.5 cm) thick in one application; if a second layer is required, install immediately after the first layer has set to a walkable hardness. If the first layer has dried over 12 hours, re-prime before the second application.
- D. Crack isolation membrane:
1. Install crack isolation membrane in accord with TCNA F125-14; install in accord with manufacturer's product data.
 2. Full-floor application: Install under all thinset and medium-bed-set floor tile, excluding where membrane waterproofing is required.
 3. Partial application: Install over substrate cracks and joints.
 4. Install tile in accord with TCNA F125-14 for crack isolation areas.
- E. Conditions of surfaces to receive tile:
1. Surfaces shall be firm, dry, clean and free of oily or waxy films.
 2. Grounds, anchors, plugs, hangers, bucks, electrical and mechanical work in or behind tile shall be installed prior to proceeding with tile work.

3.2 GENERAL TILE INSTALLATION:

- A. Install tile in accord with ANSI A108.1 through A108.17 and as specified herein.
- B. Layout:
1. Center tile within areas to avoid tiles of unequal widths at opposite walls and tiles of less than ½ tile width.
 2. Align tile joints straight and parallel to walls.
 3. Align joints in floor and base or wall tile.
 4. Locate accessories, control joints and expansion joints before installing tile.
- C. Cutting and fitting:
1. Cut and drill tiles without damaging exposed tile face. Rub cut edges smooth with Carborundum stone.
 2. Grind and fit tile at intersections, against trim and at built-in fixtures and accessories.
 3. Fit tile around outlets, pipes, fixtures and fittings so that tile edges are concealed under applied escutcheons, collars or plates.

4. Miter coved and bullnose tile in corners or use special trim shapes to maintain uniform joint widths.
- D. Joints:
1. Joint widths for tile shall be as selected by Architect.
 2. In internal vertical corners of wall tile and where tile abuts dissimilar materials, form joints using control joint filled with sealant in lieu of grout.
- E. Control and expansion joints:
1. Ascertain that control and expansion joints are located in accord with approved shop drawings, TCNA EJ171-14, and as approved in advance by Architect.
 2. Provide control joints, perimeter control joints and expansion joints through tile and setting bed.
 - a. Field of floor control joints shall be located as follows:
 - 1) Spacing indicated, but not less than the following:
 - a) Interior areas: 20'-0" to 25'-0" o. c. in each direction.
 - b) Interior areas subjected to sunlight or moisture: 8'-0" to 12'-0" o. c. in each direction.
 - 2) Over cold joints and saw-cut control joints.
 - b. Provide control joints at all perimeters.
 - c. Locations of joints shall be as approved in advance by Architect. Width of joints shall match width of grout joints, except control joint shall be not less than 1/8" wide.
 3. Prime joints in accord with sealant manufacturer's product data. Following tile work completion, seal joints in accord with TCNA EJ171-14, using specified sealant.
 4. Relocation of existing subfloor joints:
 - a. Where existing subfloor joint is required to be relocated, span joint by installing crack isolation membrane over existing joint.
 - b. Install crack isolation membrane in accord with TCNA F125-14 Partial, as herein specified.
 - c. Move joint location to the nearest tile or stone grout joint.
- F. Thresholds, transition strips and edge strips:
1. Marble thresholds: Install in accord with TCNA TR611-14. Seal joint between threshold and tile using sealant in lieu of grout.
 2. Transition strips and edge strips: Install at door openings not having thresholds, at intersections with other flooring materials, and at other locations as shown on the drawings.
- G. Tolerances:
1. Allowable lippage: Comply with ANSI A108.02 as follows:
 - a. Glazed wall tile: 1/32".
 - b. Porcelain tiles, joint width less than 1/4": 1/32".
 2. Allowable site installation tolerances: Plumb, level and true to line, meeting ANSI A108.02 as follows:
 - a. For tile with all dimensions less than 15": Maximum 1/16" in 1'-0" and maximum 1/4" in 10'-0".
 - b. For tile with any dimension greater than 15": Maximum 1/16" in 2'-0" and maximum 1/8" in 10'-0".
- H. Grout release agent: Prior to grouting tile to receive epoxy grout, apply specified grout release agent to face of tile only. Do not allow agent to migrate into joints.

3.3 TILE INSTALLATION:

- A. Floor tile with any dimension 15" or larger, medium bed set, interior:
 - 1. Setting method: Medium-bed latex Portland cement mortar.
 - 2. Standard installation method: Generally in accord with TCNA F113-14 for standard grout, and TCNA F115-14 for epoxy grout.
 - 3. Grout type: Epoxy grout. Apply grout release agent prior to grouting tile to receive epoxy grout.
- B. Floor tile with all dimensions less than 15", thinset, interior:
 - 1. Setting method: Premium latex-modified thinset mortar.
 - 2. Standard installation method: TCNA F115-14.
 - 3. Grout type: Epoxy grout. Apply grout release agent prior to grouting tile to receive epoxy grout.
- C. Wall tile and base, thinset over masonry, interior:
 - 1. Setting method: Premium latex-modified thinset mortar bond coat.
 - 2. Standard installation method: TCNA W202-14.
 - 3. Grout type: Epoxy grout. Apply grout release agent prior to grouting tile to receive epoxy grout.

3.4 CLEANING AND PROTECTION:

- A. Clean tile as work progresses, preventing accumulation of setting and grouting materials or debris on tile faces.
- B. Immediately remove stains, grout release agent, excess mortar, grout and sealant from faces of tile; comply with manufacturer's product data.
- C. Thresholds and glazed tile: Clean thresholds and glazed tile using a solution of detergent and water only. Do not use acids or harsh cleaning agents to clean thresholds or glazed tile.
- D. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions.
 - 1. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned.
 - 2. Protect metal surfaces and plumbing fixtures from effects of cleaning.
 - 3. Flush surfaces with clean water before and after cleaning.
- E. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- F. Protection: Protect installed tile work until Date of Substantial Completion by covering with kraft paper.

End of Section

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY:

- A. Related work specified elsewhere:
1. Gypsum board.

1.2 SUBMITTALS:

- A. Shop drawings; include the following:
1. Layout, including locations of lighting fixtures and grilles.
 2. Insert and hanger spacing and fastening details.
 3. Splicing method for main and cross runners.
 4. Change in level details.
 5. Support requirements for lighting fixtures, grilles and similar items.
- B. Product data: Include product descriptions and installation instructions for each material. Indicate load carrying capacity of suspension system hanger spacings and manufacturer's recommended methods for fixture support.
- C. Samples; submit the following:
1. 1'-0" by 1'-0" samples of each type and color acoustical material.
 2. Samples of each type and color suspension member and accessory.
- D. Evaluation reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

1.3 QUALITY ASSURANCE:

- A. Applicable standards; standards as referenced herein:
1. American Iron and Steel Institute (AISI).
 2. ASTM International (ASTM).
 3. Ceiling & Interior Systems Contractors Association (CISCA).
 4. Underwriters Laboratories, Inc. (UL).
- B. Seismic performance: Comply with building code requirements.
- C. Source limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.
- D. Mock-up:
1. Install complete ceiling of each type specified, in space designated by Architect. Notify Architect when spaces are ready for observation.
 2. Following Architect's acceptance, retain mock-up as a standard of quality for ceiling installation. Accepted mock-up may remain as part of finished work.

1.4 PROJECT/SITE CONDITIONS:

- A. Sequencing and scheduling: Schedule acoustical material installation to minimize need for removal and replacement of acoustical units to accommodate work of other trades.

1.5 MAINTENANCE MATERIALS:

- A. Furnish extra materials equal to one percent of each type of acoustical material supplied.
- B. Furnish suspension system components in amount sufficient to install extra ceiling units.

PART 2 - PRODUCTS

2.1 METAL SUSPENSION SYSTEMS, GENERAL:

- A. Metal suspension system standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C635-13a.
 - 1. High humidity finish: Comply with ASTM C635-13a requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
- B. Carrying channels: 16 ga. cold-rolled steel, 1-1/2" deep.
- C. Attachment devices: Size for five times the design load indicated in ASTM C635-13a, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 - 1. Hanger clips: Prefabricated metal clamps for fastening to building structure.
- D. Wire hangers, braces, and ties: Provide wires complying with the following requirements:
 - 1. Zinc-coated, carbon steel wire: ASTM A641-09a(2014), Class 1 zinc coating, soft temper.
 - 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C635-13a, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.
- E. Seismic components: Provide as required by building code:
 - 1. Seismic stabilizer bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
 - 2. Seismic struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
 - 3. Seismic clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place.
- F. Hold-down clips: Where indicated, provide suspension system manufacturer's standard hold-down clips compatible with ceiling panels specified; spaced 24 inches o.c. on all cross tees.
- G. Impact clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

2.2 STEEL SUSPENSION SYSTEMS:

- A. Acceptable manufacturers; subject to compliance with specified requirements:
 - 1. Armstrong World Industries, Inc.
 - 2. CertainTeed Corp.
 - 3. Chicago Metallic Corp.
 - 4. USG Interiors, Inc.

- B. Exposed steel grid system; 15/16" flange face.
 - 1. Structural classification: Meeting ASTM C635-13a:
 - a. Heavy Duty for seismic categories D, E and F,
 - b. Intermediate Duty for seismic categories A, B and C.
 - 2. Module: 2'-0" by 2'-0".
 - 3. Main and cross tees:
 - a. Tee material: Hot dip galvanized, cold-rolled steel.
 - b. Cap material: Hot dip galvanized, cold-rolled steel.
 - c. Design: Double web.
 - d. Tee size: 15/16" flange face width; 1-1/2" nominal height main tees.
 - 1) 2'-0" or 4'-0" long cross tees.
 - 2) Material thicknesses shall be as required to meet specified structural classifications.
 - 4. Edge molding:
 - a. For square edge panels: Minimum 0.020" thickness galvanized steel, channel or angle shaped, hemmed edges.
 - b. Flange widths:
 - 1) Non seismic category areas: Minimum 3/4".
 - 2) Seismic category C: Minimum 7/8" (or use vertical perimeter wires not more than 8" from wall).
 - 3) Seismic categories E, D and F: Minimum 2".
 - 5. Finish on exposed components: Chemically treated for paint adhesion with factory-applied, low-gloss white paint.

2.3 ACOUSTICAL CEILING PANELS:

- A. Acceptable manufacturers; subject to compliance with specified requirements:
 - 1. Armstrong World Industries, Inc.
 - 2. CertainTeed Corp.
 - 3. USG Interiors, Inc.
- B. Basis of design: As scheduled on drawings. Acoustical ceilings of similar design and construction, as manufactured by other acceptable manufacturers, may be submitted for Architect's consideration. Acceptance is subject to compliance with specified design criteria, as evidenced by submittal of specified product data, and Architect's approval.
- C. Characteristics:
 - 1. Size: 2'-0" by 2'-0".
 - 2. Thickness: 5/8".
 - 3. Edges: Square.
 - 4. Finish: Factory-applied, washable paint.

2.4 ACCESSORIES:

- A. Acoustical sealant:
 - 1. Acoustical sealant for exposed and concealed joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C834-14 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90-09.
 - 2. Acoustical sealant for concealed joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

3. Sealant shall have a VOC content of 250 g/L or less.
- B. Sound attenuation blankets: 1-1/2" thickness, minimum 2-1/2 lb. density, paperless, semi-rigid, mineral fiber blanket.
- C. T-Grid support clip:
 1. Acceptable products:
 - a. Armstrong World Industries, Inc., Beam End Retainer Clip Item 7395.
 - b. Chicago Metallic corp., Perimeter clip 1499.
 - c. Erico Products, Inc., Caddy TGE T-Grid support clip.
 - d. USG Industries, Inc., Mac 2.
 2. Characteristics: Mechanical clip for attaching acoustical "T" to edge molding without exposed fasteners in grid system.

PART 3 - EXECUTION

3.1 SUSPENSION SYSTEM INSTALLATION:

- A. Install suspension system in accord with manufacturer's product data, ASTM C636-13, ASTM E580-14 and CISCA recommendations, except for more stringent requirements specified herein.
- B. Layout:
 1. Center grid system within areas to avoid panels of unequal widths at opposite walls and panels of less than 1/2 width.
 2. Align grid members straight and perpendicular to walls.
 3. Locate accessories, control joints and expansion joints before installing grid system.
- C. Seismic requirements:
 1. Comply with building code for seismic restraint requirements.
 2. Install suspension systems in accord with ASTM E580-14 and ASCE 7-10.
 3. Lateral bracing: In addition to complying with ASTM C636-13, ASTM E580-14 and ASCE 7-10, install suspension systems in accord with CISCA 0-2 for Seismic Design Category C, CISCA 3-4 for Seismic Design Categories D, E, and F, and applicable building code requirements.
 4. Perimeter requirements:
 - a. Category C: Where perimeter angle is less than 7/8", provide perimeter vertical hanger wires not less than 8" from wall.
 - b. Categories D, E and F: Provide perimeter vertical hanger wires not less than 8" from wall.
 - c. Grid end/wall details:
 - 1) Category C: Minimum 3/8" clearance on all 4 walls.
 - 2) Categories D, E and F: Two adjacent walls shall be tight and two adjacent walls shall have a minimum 3/4" clearance.
- D. Hangers:
 1. Space hangers for carrying channels or main tees at 4'-0" o. c. maximum. Secure to building structure.
 2. Install additional hangers at ends of each suspension member, within 6" of end of member or wall.
 3. Install additional hangers within 6" of each corner of lighting fixtures, grilles and similar items.
 4. Splay wires no more than 5" in 2'-6" vertical drop.

5. Where spacing of hangers for main tees exceeds maximum specified spacing due to interference by adjacent construction, indirect-hang tees using carrying channels to maintain maximum hanger spacing.
 6. Wrap wire minimum of three times horizontally, turning ends upwards.
- E. Carrying channels: Saddle-tie carrying channels to main structure for indirect-hung suspension system.
- F. Direct-hung, exposed grid system, 2'-0" by 2'-0" module:
1. Space main tees at 4'-0" o. c., maximum, perpendicular to structure.
 2. Locate cross tees at 2'-0" o. c., perpendicular to main tees.
 3. Space cross tees at 2'-0" o. c., perpendicular to previously installed cross tees, to form 2'-0" by 2'-0" grid module. Connect to cross tees through slots in main tees.
- G. Level and square suspension system components within specified tolerances prior to beginning ceiling material installation.
- H. Install cross tees adjacent to lighting fixtures and grilles on each side not supported by main tees. Support no fixtures on main or cross tees when fixture weight results in dead load exceeding deflection capacity of suspension system.
- I. Where cut tees intersect other tees or edge moldings without mechanical attachment, attach components using T-Grid support clip. At contractor's option tees may be attached directly to partition with tie wire.
- J. Wall moldings:
1. Install wall molding at intersection of suspended ceiling and vertical surfaces.
 2. Miter corners where wall moldings intersect or install corner caps.
 3. Attach to vertical surfaces with mechanical fasteners.
 4. In each orthogonal horizontal direction, attach one end of ceiling grid to closure angle. The other end in each horizontal direction shall have 3/4" clearance from wall and shall rest upon and be free to slide on closure angle.
- K. Where grid system exists in an unrestrained condition, brace back to building structure using hanger wire, main tee or carrying channel braces spaced at 4'-0" o. c., maximum.

3.2 ACOUSTICAL UNIT INSTALLATION:

- A. Install acoustical units in level plane, in straight line courses, within specified tolerances.
- B. Place acoustical materials to bear all around on suspension members.
- C. Pattern shall be symmetrical about centerline of area, unless otherwise indicated. Lay out units having directional pattern in same direction.
- D. Where cutting of acoustical units is required, cut so that no cut or damaged edges are visible in finished work.
- E. Hold-down clips:
1. Install acoustical units surrounding recessed troffer lights with hold-down clips to prevent movement or displacement of units.
 2. Install hold-down clips at exterior ceiling panels panels.

- F. Lay sound attenuation blankets over ceilings in designated spaces.
- G. Allowable tolerances:
 - 1. Deflection: Suspension system components, hangers and fastening devices supporting lighting fixtures, ceiling grilles and acoustical units shall have maximum deflection of 1/360 of the span when tested in accord with ASTM C635-13a.
 - 2. Bow, camber and twist: Not exceeding tolerances established by ASTM C635-13a.
 - 3. Variation from level in finished ceiling: $\pm 1/8$ " in 12'-0".

3.3 CLEANING:

- A. Clean soiled or discolored unit surfaces after installation.
- B. Touch up scratches, abrasions, voids and other defects in painted metal surfaces.
- C. Remove and replace damaged and stained acoustical units with new units.

End of Section

SECTION 09 6500
RESILIENT FLOORING

PART 1 - GENERAL

1.1 SUBMITTALS:

- A. Product data: Indicate product characteristics and installation requirements, including manufacturer's recommended adhesives and maintenance instructions.
- B. Samples: Submit full size samples for each type color and pattern of flooring and accessory required.

1.2 QUALITY ASSURANCE:

- A. Applicable standards, as referenced herein: ASTM International (ASTM).
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups for floor tile including resilient base and accessories.
 - 2. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations indicated in locations directed by Architect.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.3 PROJECT/SITE CONDITIONS:

- A. Environmental requirements:
 - 1. Maintain temperature in space to receive resilient materials at not less than 70°F. for not less than 24 hours before, during and for 48 hours after installation.
 - 2. Maintain minimum temperature of 55°F. after flooring is installed, except as specified above, for duration of project.
- B. Protection: Protect finished flooring, base and accessories from staining, marring or other physical damage by work of other trades. Cover or mask surfaces as required.

1.4 MAINTENANCE MATERIAL:

- A. Furnish additional floor tile of each color and pattern of tile as maintenance material. Furnish at the rate of one carton for each 1000 sq. ft. of floor surface or fraction thereof.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS:

- A. Fire-test-response characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E648-14c or NFPA 253 by a qualified testing agency.

1. Critical radiant flux classification: Class I, not less than 0.45 W/sq. cm.

2.2 VINYL COMPOSITION TILE:

- A. Acceptable manufacturers:
 1. Armstrong World Industries, Inc.
 2. Mannington Commercial.
 3. Tarkett, Inc.
- B. Type: Meeting ASTM F1066-04(2014), Class 2 for through pattern tile.
- C. Size: 1'-0" by 1'-0" face size by 1/8" thickness.
- D. Colors: Match colors scheduled on drawings.

2.3 RUBBER BASE:

- A. Acceptable manufacturers:
 1. Burke Flooring, a Div. of Burke Industries.
 2. Roppe Corp.
 3. Johnsonite, Inc.
- B. Characteristics:
 1. Type: Minimum 48% rubber, 100% vulcanized; meeting ASTM F1861-08(2012), Type TP.
 2. Length: Minimum 120'-0" rolls.
 3. Thickness: 1/8".
 4. Height: 4".
 5. Style: Coved.
 6. Colors: Match colors scheduled on drawings.
- C. Corners: Preformed inside and outside corners. Preformed corners shall match base in color, sheen and overall appearance.

2.4 ACCESSORIES:

- A. Acceptable manufacturers:
 1. Burke Flooring Products, a Div. of Burke Industries.
 2. Marley Flexco (USA), Inc.
 3. Johnsonite, Inc.
 4. R. C. Musson Rubber Co.
 5. Roppe Corp.
- B. Reducers:
 1. Material: Vinyl.
 2. Thickness: Same as abutting floor materials.
 3. Width(s): 1".
 4. Edges: Tapered.
 5. Colors: As selected by Architect from manufacturer's standard colors.

2.5 INSTALLATION MATERIALS:

- A. Leveling compound; acceptable products:
 1. Custom Building Products, LevelQuik RS.
 2. Euclid Chemical Co., Super Flo-Top.
 3. Mapei, Ultraplan 1 Plus.

- B. Adhesives: Water-resistant types and brands of solvent-free adhesive recommended by flooring material manufacturer's product data for installation conditions indicated.
 - 1. VOC Content: Comply with the following limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. VCT adhesives: Not more than 50 g/L.
 - b. Cove Base Adhesives: Not more than 50 g/L.
- C. Wax and buffing compound: Types recommended by floor covering manufacturer for the particular type of flooring material.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Prepare surfaces to receive resilient material in accord with flooring manufacturer's instructions.
- B. Grind high areas and fill depressions with leveling compound where required to produce smooth installation and for proper alignment of resilient flooring with adjacent flooring materials.
- C. Perform bond and moisture tests on subfloors in accord with ASTM F2170-11 and resilient flooring manufacturer's product data, to determine if surfaces are acceptable to receive specified resilient flooring products. Correct conditions detrimental to resilient flooring installation prior to starting installation.
- D. Remove dirt, oil, grease or other foreign matter from surfaces to receive floor covering or accessories.

3.2 APPLICATION OF ADHESIVES:

- A. Mix and apply adhesives in accord with resilient material manufacturer's product data. Apply with notched trowel or other tools as recommended by adhesive manufacturer.
- B. Provide safety precautions during mixing and applications as recommended by adhesive manufacturer.
- C. Apply adhesive to only that area which can be covered by resilient material within the recommended working time of the adhesive.
 - 1. Remove adhesive which dries or films over.
 - 2. Do not soil walls, bases or adjacent areas with adhesives.
 - 3. Remove spilled or misplaced materials.

3.3 TILE INSTALLATION:

- A. Lay tile in accord with resilient tile manufacturer's product data.
- B. Lay tile beginning at center of room or space, working toward perimeter.
 - 1. Adjust starting point as necessary to provide border tile widths equal to or greater than a half width tile.
 - 2. Joints between tile shall be fitted without gap; butted together.
 - 3. Cut border tile to fit within 1/32" of abutting surfaces.

- C. Fit flooring material into breaks and recesses, against bases, around pipes and penetrations, under saddles or thresholds and around permanent cabinets and equipment.
- D. Lay tile with grain or pattern running in same direction as adjacent tiles.

3.4 INSTALLATION OF BASE:

- A. Workmanship:
 - 1. Unroll base material and allow to relax for 24 hours, minimum, prior to installation. Cut into lengths for minimum number of joints. Double-cut adjoining lengths.
 - 2. Install with tight butt joints with no joint widths greater than 1/64".
- B. Top-set base:
 - 1. Apply adhesive and adhere to vertical surfaces.
 - 2. Press down so that bottom edge follows floor profile.
 - 3. Form internal corners using premolded corners.
 - 4. Form external corners using premolded corners.
 - 5. Scribe base to abutting materials.

3.5 ACCESSORY INSTALLATION:

- A. Cut materials to lengths and sizes indicated.
- B. Resilient reducers:
 - 1. Apply adhesives and bond to substrate.
 - 2. Center reducers in door openings.
 - 3. Fit edge to door frame jambs without visible gaps or cracks.
 - 4. Fit edges to abutting floor materials for flush fit.

3.6 CLEANING:

- A. Upon completion of installation, clean surfaces using a neutral cleaner acceptable to material manufacturer.
- B. Just prior to Date of Substantial Completion, buff no-wax floors using buffing compound for no-wax finish or apply two coats of non-slip wax to clean waxable floor surfaces and buff.

End of Section

SECTION 09 6516
RUBBER SHEET FLOORING

PART 1 - GENERAL

1.1 SUMMARY:

- A. Work of this section includes rubber flooring and accessories.
- B. Related work specified elsewhere:
 - 1. Cast-in-concrete.
 - 2. Resilient flooring.

1.2 REFERENCES:

- A. ASTM International (ASTM):
 - 1. ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
 - 2. ASTM F 1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
 - 3. ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using *In situ* Probes

1.3 SUBMITTALS:

- A. Submit manufacturer's product data, installation and maintenance instructions.
- B. Submit shop drawings, seaming plan, and coving details.
- C. Submit manufacturer's standard samples showing the required colors for flooring and applicable accessories.

1.4 QUALITY ASSURANCE AND REGULATORY REQUIREMENTS:

- A. Installer shall be competent in installation of rubber flooring and using the specified Recycled rubber commercial flooring .
- B. Provide type of flooring and accessories supplied by one manufacturer, including leveling, patching compounds, and adhesives.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Deliver materials in good condition to project site in manufacturer's original unopened containers that bear name and brand of manufacturer, project identification, and shipping and handling instructions.
- B. Store materials in a clean, dry, enclosed space off the ground, and protected from weather and from extremes of heat and cold. Protect adhesives from freezing. Store flooring, adhesives and accessories in spaces where they will be installed for at least 48 hours before beginning installation.

1.6 PROJECT CONDITIONS:

- A. Maintain a minimum temperature in spaces to receive flooring and accessories of 65°F (18°C) and a maximum temperature of 85°F (29°C) for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 55°F (13°C) in areas where work is completed. Protect materials from direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances.
- B. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring. Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond and moisture tests.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Acceptable manufacturers:
 - 1. Mannington Mills, Inc.
 - 2. Ecore International.
 - 3. Regupol America.
- B. Basis of design: As scheduled on drawings.

2.2 RESILIENT FLOORING MATERIALS:

- A. Type: Non-laminated, single-ply, rubber surfacing.
- B. Material: Made from high percentage of ground post-consumer recycled tires (72-91%) depending upon color or sku. Black color shall be 91%. There shall be a minimum of 4% pre-consumer recycled content for the colorations utilizing color flecks, in addition to post-consumer recycled content. This shall come from reprocessed, pre-consumer EPDM rubber used as color flecks.
- C. Characteristics:
 - 1. Sheet dimension: Rolled rubber surface shall have an overall thickness of 3/8" standard supplied in 4' X 50' roll size.
 - 2. Sheet weight: 2.3 lb/ft². Roll Weight 400 lbs.
 - 3. Sheet standard tolerances:
 - a. Roll width: ± 0.010"
 - b. Roll length: +1% - 0"
 - c. Thickness: ± 0.3 mm
 - 4. Colors: Match colors scheduled on drawings.
 - 5. Tensile strength (ASTM D 412): Min. 200 psi
 - 6. Flexibility (ASTM F 137): Pass 2" Mandrel
 - 7. Static load limit: 400 psi
 - 8. Coefficient of friction: > 0.8 (Meets ADA Guidelines)
 - 9. Chemical Resistance: (ASTM F925) - No change.
 - a. 70% Isopropyl Alcohol.
 - b. 5% Sodium Hydroxide.
 - c. 5% Hydrochloric Acid.
 - d. 5% Ammonia.
Bleach.
 - e. 5% Phenol.

- f. Sulfuric Acid.
- 10. Thermal Conductivity: approximately 0.4 Btu-in/hr- ft²-°F (ASTM C518).
- 11. VOC: Certified under FloorScore as low-emitting.
- 12. CHPS/CA 01350: Meets criteria as low-emitting.

2.3 ADHESIVES:

- A. Provide rubber flooring manufacturer's recommended one-component moisture-cured polyurethane adhesive or two component epoxy adhesive for use under the specified rubber commercial sheet flooring.

2.4 ACCESSORIES:

- A. For patching, smoothing, and leveling monolithic subfloors (concrete, terrazzo, quarry tile, ceramic tile, and certain metals), provide Portland cement-based latex underlayment or patch and skim coat as recommended by the rubber flooring manufacturer's product data.
- B. Provide transition / reducing strips tapered to meet abutting materials.
- C. Provide threshold of thickness and width as indicated on drawings.
- D. Provide resilient edge strips of width indicated on drawings, of equal gauge to flooring, homogeneous rubber composition, tapered or bull nose edge, with color to match or contrast with the flooring, or as selected by the architect from standard colors available.
- E. Provide metal edge strips of width indicated on drawings and of required thickness to protect exposed edges of flooring. Provide units of maximum available length to minimize number of joints. Use butt-type metal edge strips for concealed anchorage, or overlap-type metal edge strips for exposed anchorage. Unless otherwise shown, provide strips made of extruded aluminum with a mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.
- B. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.
- C. Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.
- D. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation shall indicate acceptance of substrates with regard to conditions existing at the time of installation.

3.2 PREPARATION:

- A. Smooth concrete surfaces, removing rough areas, projections, ridges, and bumps, and filling low spots, control or construction joints, and other defects with MVP 2023 portland cement-based latex underlayment or patch and skim coat as recommended by the flooring manufacturer.
- B. Remove paint, varnish, oils, release agents, sealers and waxes. Remove residual adhesives as recommended by flooring manufacturer. Remove curing and hardening compounds not compatible with the adhesives used, as indicated by a bond test or by compound manufacturer's recommendations for flooring. Avoid organic solvents.
- C. Perform subfloor moisture testing using either Calcium Chloride Test (ASTM F 1869) [5 lb per 100 sq-ft/24h MVER or less] or % RH (ASTM F 2170) [< 75 % RH], along with Bond Tests as described in ASTM F 710 and flooring manufacturer's installation handbook to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring.
- D. Vacuum or broom-clean surfaces to be covered immediately before the application of flooring. Make subfloor free from dust, dirt, grease, and all foreign materials.

3.3 INSTALLATION OF FLOORING:

- A. Install flooring in accord with manufacturer's product data.
- B. Install flooring wall to wall before installation of floor-set cabinets, casework, furniture, equipment, movable partitions, etc. Extend flooring into toe spaces, door recesses, closets, and similar openings as indicated on drawings.
- C. If required, install flooring on pan-type floor access covers. Maintain continuity of color and pattern within pieces of flooring installed on these covers. Adhere flooring to subfloor around covers and to covers.
- D. Scribe, cut, and fit to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.
- E. Adhere flooring to subfloor without cracks, voids, raising and puckering at the seams. Roll with a 100-pound (45.36 kilogram) roller in field areas. Hand-roll flooring at perimeter and seams to assure adhesion. Refer to specific rolling instructions of flooring manufacturer's product data.
- F. Lay flooring to provide a minimum number of seams. Avoid cross seams, filler pieces, and strips. Match edges for color shading and pattern at seams in compliance with manufacturer's product data.
- G. Install flooring with adhesives, tools, and procedures in strict accord with manufacturer's product data. Observe recommended adhesive trowel notching, open times, and working times.

3.4 INSTALLATION OF ACCESSORIES:

- A. Place resilient edge strips tightly butted to flooring, and secure with adhesive recommended by edge strip manufacturer's product data. Install edge strips at edges of flooring that would otherwise be exposed.

- B. Apply butt-type metal edge strips where shown on drawings, before flooring installation. Secure units to substrate, complying with edge strip manufacturer's product data.

3.5 CLEANING AND PROTECTION:

- A. Perform initial maintenance according to latest edition of the manufacturer's maintenance and warranty literature.
- B. Protect installed flooring as recommended by flooring manufacturer's product data against damage from rolling loads, other trades, or placement of fixtures and furnishings.

End of Section

SECTION 09 9000
PAINTING AND COATING

PART 1 - GENERAL

1.1 SUMMARY:

- A. Work of this section includes:
 - 1. Touching up of shop-applied prime coats.
 - 2. Preparation of surfaces to receive finishes.
 - 3. Painting, staining or otherwise finishing of surfaces, except as otherwise indicated.

- B. Related work specified elsewhere:
 - 1. Shop-applied primer coats.
 - 2. Joint sealants.
 - 3. Wall coverings.
 - 4. Special finishes.
 - 5. Piping identification.
 - 6. Prefinished items.

1.2 DEFINITIONS:

- A. Properly painted surface: The painting contractor shall produce properly painted surfaces as herein defined, and shall obtain Architect's approval of all surfaces.
 - 1. A "properly painted surface" is defined as uniform in appearance, color, texture, hiding and sheen.
 - 2. Surfaces shall be free of foreign material, lumps, skins, runs, sags, holidays, misses, or insufficient coverage.
 - 3. Surfaces shall be free of drips, spatters, spills or overspray caused by the painting contractor's workforce.
 - 4. To determine whether a surface has been "properly painted", the surface shall be examined without magnification at a distance of thirty-nine (39) inches or one (1) meter, or more, under finished lighting conditions and from a normal viewing position.

- B. Standard coating terms: As defined in ASTM D16-14.

- C. Commercial: Painter grade products.

- D. DFT: Dry film thickness of the coating.

- E. Premium: Best quality product (top of the line):

- F. VOC: Volatile Organic Compounds found in primers, paints, sealers and stains. VOC levels are designated in grams per liter (g/L).

1.3 PERFORMANCE REQUIREMENTS:

- A. DFT for each primer, paint, sealer and stain shall be as recommended by product manufacturer's product data.

1.4 SUBMITTALS:

- A. Product data:
 - 1. Submit complete list of products proposed for use at least 30 days prior to commencement of painting work.
 - 2. Indicate manufacturer, brand name, quality, type, and sheen for each type of paint and for each surface to be finished. Indicate VOC rating and compliance with applicable regulations.
 - 3. Indicate manufacturer's instructions regarding mixing, surface preparation and application. Include application rates, film thickness and required primers.
 - 4. Intent of Contractor to use products specified does not relieve him from responsibility of submitting product list.

- B. Card stock brush-outs: Prepare two sets of color coat brush-outs for each paint and stain color and sheen scheduled, applying actual finish color coat to standard sample card stock, minimum 80 sq. in. size.

- C. Substrate brush-outs:
 - 1. In addition to color coat brush-outs, submit one actual brush-out sample application for each paint type, color and sheen as applicable to the following substrates.
 - 2. Apply complete finish system in the number of coats specified, to the actual substrate material or simulated material indicated; allow 1" offset of each successive coat along one edge to illustrate successive applications.
 - a. Concrete unit masonry: One face of a concrete block of type and texture used on the project.
 - b. Gypsum board and concrete: Apply over gypsum board, 1'-0" by 1'-0" size, edges taped and sanded.
 - c. Metals: Apply over hardboard, 1'-0" by 1'-0" size.
 - d. Painted wood: Wood stock typical of type, color and cut used on the project, minimum 6" wide by 1'-0" long.

1.5 QUALITY ASSURANCE:

- A. Applicable standards:
 - 1. American Coatings Association (ACA), Gloss Standard.
 - 2. ASTM International (ASTM), as referenced herein.
 - 3. American National Standards Institute (ANSI) Performance Standards.
 - 4. Environmental Protection Agency (EPA), volatile organic compounds (VOC) standards as required by local codes and regulations.
 - 5. Master Paint Institute (MPI) established paint categories and standards.
 - 6. Occupational Safety & Health Act (OSHA) Safety Standards.
 - 7. Ozone Transmission Commission (OTC) established levels of Volatile Organic Compounds.
 - 8. Paint Decorating Contractors of America (PDCA) Application Standard, P1 Standard and P5 Standard.

1.6 DELIVERY, STORAGE AND HANDLING:

- A. Delivery: Deliver materials to project site ready-mixed in original containers with labels intact; labels bearing manufacturer's name, paint type, color and recommended installation and reducing procedures.

- B. Storage and handling:
 - 1. Store materials in location acceptable to Architect.
 - 2. Coating materials and thinners stored on site shall be kept in a clean, secure and climate controlled area.
 - 3. Labels shall remain on containers used to hold primers, paints or stains while on site. Containers without labels shall be disposed of.
 - 4. Product name, number, health and safety information, and precautions shall be legible at all times during storage and use.
 - 5. Close containers at end of day's work. Leave no materials open.
- C. Waste management and disposal:
 - 1. Disposal containers for recycled materials must be established on site.
 - 2. Dispose of rags containing solvent, daily.
 - 3. Dispose of hazardous coatings in accord with state, county and local regulations for hazardous waste disposal.

1.7 PROJECT/SITE CONDITIONS:

- A. Environmental requirements:
 - 1. Comply with manufacturer's product data as to environmental conditions under which materials may be applied.
 - 2. Apply no materials in spaces where dust is being generated.
 - 3. Comply with applicable VOC regulations.
- B. Protection: Cover finished work of other trades and surfaces not being painted concurrently and prefinished items.
- C. Safety precautions:
 - 1. Provide temporary fire protection equipment in materials storage area.
 - 2. Prohibit smoking in storage area.

1.8 MAINTENANCE:

- A. Extra materials:
 - 1. Provide one gallon of each type and color of paint and stain in full unused cans.
 - 2. Cans shall be marked with color name, number and type of paint and stain.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Acceptable manufacturers: Except as otherwise noted, products specified as a standard of quality are manufactured by PPG Paints. Products of the following manufacturers similar in type and quality are acceptable for use, subject to approval of product list:
 - 1. PPG Paints.
 - 2. Benjamin Moore Co.
 - 3. Sherwin-Williams Co.
- B. Where products other than those of the manufacturer listed as the standard of quality are specified in Painting Schedule, such products have been selected to achieve specific results and substitutions will be allowed only in accord with Product Substitution Procedures section.

2.2 PAINTING MATERIALS:

- A. Miscellaneous materials:
 - 1. Paint thinners and tints shall be products of same manufacturer as paints or approved by him for use with his products.
 - 2. Shellac, turpentine, patching compounds and similar materials required for execution of work shall be pure, best quality products.
- B. Paint and stain colors shall be as indicated on Color Schedule with final approval based on brush-out submittal.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Surfaces to receive finishes shall be dry and free of debris, oils, dust or other deleterious materials.
- B. Existing surfaces:
 - 1. For previously painted surfaces, remove dirt, debris and chalk by washing with detergent and water. Sand glossy surfaces. Remove loose paint and blisters by scraping and sanding. Apply bond coat when required by paint manufacturer's product data.
 - 2. Previously painted metal surfaces to remain shall be wire-brushed and cleaned of existing paint and rust.
 - 3. Treat mildewed surfaces with a solution of one quart hypochlorite bleach to a half cup of detergent to one gallon water. Rinse and allow to dry prior to painting.
 - 4. Previously painted masonry:
 - a. Where existing paint is loose or blistered, remove by scraping or brushing.
 - b. Remove debris and chalking from surfaces by washing with detergent and water. Flush with clean water. Touch up with material specified for finish.
- C. Where finish materials abut or are abutted by dissimilar materials, caulk joints in accord with Joint Sealants section.
- D. Lumber, plywood and veneered wood surfaces:
 - 1. Apply shellac, maximum two pounds cut to knots, pitch and resinous sapwood prior to application of first paint or stain coat.
 - 2. For surfaces to receive opaque finish, fill nail holes, cracks, joints and defects with spackling compound. Apply after first coat of paint.
 - 3. For surfaces to receive transparent finish, fill nail holes, cracks and defects with wood filler matching finish color.
 - 4. Sand surfaces smooth except where rough sawn surfaces are indicated. Final step shall remove scuffs, handling marks and effects of moisture exposure. Dust to remove debris.
 - a. Sand plane surfaces using sanding block; touch sand moldings in manner preventing removal of sharp edges or obscuring profile.
 - b. Moldings cut with machine finish or minimum 16 knife cuts per inch shall not require further sanding except to correct irregularities.

- c. Sand surfaces within normal visual range, including surfaces within 10'-0" of floor level, using not less than 80 grit abrasive exterior or 100 grit abrasive interior, except increase to 120 to 180 grit abrasive for transparent finished interior surfaces.
 - d. Install prefinished or presurfaced items following finishing or sanding of adjacent surfaces. Replace prefinished items damaged by finishing of adjacent work.
 - E. Gypsum board:
 - 1. Fill narrow, shallow cracks and small holes with patching compound. Allow to dry and sand smooth without raising nap of gypsum board paper.
 - 2. Gypsum board shall be finished as specified in Gypsum Board section prior to painting.
 - F. Concrete:
 - 1. Fill cracks, holes and irregularities with cement grout.
 - 2. Remove laitance, oil, grease, dirt and debris from surfaces. Allow concrete to cure prior to paint application.
 - G. Concrete unit masonry: Rub to remove loose mortar and debris. Fill irregularities with cement grout.
 - H. Galvanized metals:
 - 1. Test for passivator or stabilizer using copper sulfate solution (20 grams of copper sulfate in one liter of water). If passivator or stabilizer is present, remove by brush blasting, sanding or chemical etching.
 - 2. Wash with xylol to remove grease, oil and contaminants. Wipe dry with clean cloth.
 - I. Aluminum:
 - 1. Sand or scrape to remove oxides.
 - 2. Wash with xylol to remove grease, oil and contaminants. Wipe dry with clean cloth.
 - J. Ferrous metals:
 - 1. Wire-brush or sandpaper to remove rust and mill scale.
 - 2. Solvent-clean with xylol to remove grease, oil and contaminants. Wipe dry with clean cloth.
- 3.2 APPLICATION:
- A. Apply paint only when moisture content of surfaces is within limits recommended in product data. Apply paint materials using clean brushes, rollers or spraying equipment.
 - B. Apply materials at rate not exceeding that recommended in product data for surface being painted, less ten percent for losses.
 - C. Comply with product data for drying time between coats.
 - D. Sand and dust between coats to remove defects visible from a distance of 5'-0".
 - E. Finish coats shall be smooth, free of brush marks, streaks, laps or pile-up of paint, skipped or missed areas. Do not apply additional coats until completed coat has been observed by Architect. Only these coats of paint will be considered in determining number of coats applied.

- F. Make edges of paint adjoining other materials or colors clean and sharp without overlapping.
- G. Primer coats may be omitted for surfaces specified to receive factory-applied primer, if primer is compatible with finish coats. If primer coats are not compatible, substitute a bond coat as recommended by paint manufacturer for specified primer coat.
- H. Where two-coat finish is specified, prime coat shall be tinted to approximate finish color.
- I. Where portion of finish on gypsum board partition is damaged or unacceptable, refinish entire surface of partition.
- J. Seal tops and bottoms of interior doors with prime coat only; side edges same as faces.
- K. Finish top, bottom and side edges of exterior doors same as faces.
- L. Paint inside of ductwork flat black for entire area visible through ceiling openings. Paint underside of ductwork and other above-ceiling items flat black for entire area visible through ceiling openings.
- M. Paint exposed piping and ductwork in painted spaces same as adjacent wall surfaces.
- N. Paint exposed grilles and registers in public spaces.
- O. Paint walls, exposed structure, handrails and exposed ductwork and piping in stairwells.
- P. Remove and protect hardware, accessories, device plates, lighting fixtures, factory-finished work and similar items, or provide in-place protection. Upon completion of each space, replace removed items.
- Q. Unless otherwise indicated, paint exposed structural system.
- R. Back prime finish carpentry with material specified for prime coat, without runs on face. Finish cut edges prior to installation.
- S. Unless otherwise indicated, paint construction on roof top, including prefinished mechanical and electrical equipment.
- T. Unless otherwise indicated, paint ground mounted mechanical, plumbing and electrical equipment, including prefinished equipment.
- U. The following surfaces do not require painting:
 - 1. Face brick.
 - 2. Architectural precast concrete.
 - 3. Prefinished and factory-finished surfaces and items, except where indicated otherwise.
 - 4. Concealed ductwork, conduit and piping.

3.3 EXTERIOR PAINT SCHEDULE:

- A. Concrete (Other Than Concrete Unit Masonry): Provide the following finish systems over exterior concrete, stucco, and brick masonry substrates.
 - 1. Flat acrylic finish:
 - a. First coat: PPG; 4-603 Perma-Crete Int/ Ext Alkali Resistant Primer (88 g/L VOC); 1.2 to 1.5 Dry Mils.
 - b. Second coat: PPG; 6-610XI Series SpeedHide Exterior Flat Acrylic Latex (<50 g/L VOC); 1.5 Dry Mils.
 - c. Third coat: PPG; 6-610XI Series SpeedHide Exterior Flat Acrylic Latex (<50 g/L VOC); 1.5 Dry Mils.

- B. Concrete unit masonry (New): Provide the following finish systems over exterior concrete unit masonry:
 - 1. Flat acrylic finish:
 - a. First coat: PPG; 6-7 SpeedHide Int/Ext Masonry Block Filler Latex (<50 g/L VOC); 7.1 Dry Mils.
 - b. Second coat: PPG; 6-610XI Series SpeedHide Exterior Flat Acrylic Latex (<50 g/L VOC); 1.5 Dry Mils.
 - c. Third coat: PPG; 6-610XI Series SpeedHide Exterior Flat Acrylic Latex (<50 g/L VOC); 1.5 Dry Mils.

- C. Smooth wood: Provide the following finish systems over smooth wood siding, wood trim, and other smooth exterior wood surfaces:
 - 1. Flat acrylic finish:
 - a. First coat: PPG; 6-609 SpeedHide Exterior House and Trim Wood Primer Flat (89 g/L VOC); 1.6 Dry Mils.
 - b. Second coat: PPG; 6-610XI Series SpeedHide Exterior Flat Acrylic Latex (<50 g/L VOC); 1.5 Dry Mils.
 - c. Third coat: PPG; 6-610XI Series SpeedHide Exterior Flat Acrylic Latex (<50 g/L VOC); 1.5 Dry Mils.

- D. Wood trim: Provide the following finish systems over exterior wood trim:
 - 1. Semi-gloss acrylic-enamel finish:
 - a. First coat: PPG; 6-609 SpeedHide Exterior House and Trim Wood Primer Flat (89 g/L VOC); 1.6 Dry Mils.
 - b. Second coat: PPG; 6-900XI Series SpeedHide Exterior House and Trim Semi-gloss Acrylic Latex (<50 g/L VOC); 1.4 Dry Mils.
 - c. Third coat: PPG; 6-900XI Series SpeedHide Exterior House and Trim Semi-gloss Acrylic Latex (<50 g/L VOC); 1.4 Dry Mils.

- E. Plywood: Provide the following finish systems over exterior plywood:
 - 1. Semi-gloss acrylic-enamel finish:
 - a. First coat: PPG; 6-609 SpeedHide Exterior House and Trim Wood Primer Flat (89 g/L VOC); 1.6 Dry Mils.
 - b. Second coat: PPG; 6-900XI Series SpeedHide Exterior House and Trim Semi-gloss Acrylic Latex (<50 g/L VOC); 1.4 Dry Mils.
 - c. Third coat: PPG; 6-900XI Series SpeedHide Exterior House and Trim Semi-gloss Acrylic Latex (<50 g/L VOC); 1.4 Dry Mils.

- F. Ferrous metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.
1. Semi-gloss acrylic-enamel finish:
 - a. First coat: PPG; 90-712 Series Pitt-Tech Int/Ext Industrial DTM Primer/Finish Enamel (123 g/L VOC compliant as anti-corrosive product); 2.0 to 3.0 Dry Mils.
 - b. Second coat: PPG; 6-900XI Series SpeedHide Exterior House and Trim Semi-gloss Acrylic Latex (<50 g/L VOC); 1.4 Dry Mils.
 - c. Third coat: PPG; 6-900XI Series SpeedHide Exterior House and Trim Semi-gloss Acrylic Latex (<50 g/L VOC); 1.4 Dry Mils.
- G. Zinc-coated metal: Provide the following finish systems over exterior zinc-coated metal surfaces:
1. Semi-gloss acrylic-enamel finish:
 - a. First coat: PPG; 90-712 Series Pitt-Tech Int/Ext Industrial DTM Primer/Finish Enamel (123 g/L VOC compliant as anti-corrosive product); 2.0 to 3.0 Dry Mils.
 - b. Second coat: PPG; 6-900XI Series SpeedHide Exterior House and Trim Semi-gloss Acrylic Latex (<50 g/L VOC); 1.4 Dry Mils.
 - c. Third coat: PPG; 6-900XI Series SpeedHide Exterior House and Trim Semi-gloss Acrylic Latex (<50 g/L VOC); 1.4 Dry Mils.
- H. Aluminum: Provide the following finish systems over exterior aluminum surfaces:
1. Semi-gloss acrylic-enamel finish:
 - a. First coat: PPG; 90-712 Series Pitt-Tech Int/Ext Industrial DTM Primer/Finish Enamel (123 g/L VOC compliant as anti-corrosive product); 2.0 to 3.0 Dry Mils.
 - b. Second coat: PPG; 6-900XI Series SpeedHide Exterior House and Trim Semi-gloss Acrylic Latex (<50 g/L VOC); 1.4 Dry Mils.
 - c. Third coat: PPG; 6-900XI Series SpeedHide Exterior House and Trim Semi-gloss Acrylic Latex (<50 g/L VOC); 1.4 Dry Mils.
- I. Ferrous metal (Factory coated) – Canopy and support:
1. Surface preparation: Surfaces shall be rendered clean, dry and free from dirt, loose paint, oil, grease, chalk, wax, rust, loose mill scale and other contamination per method SSPC-SP2 or SP3 Hand Tool or Power Tool Cleaning.
 - a. Dull glossy surfaces by sanding or best available means. Sanding dust and residual contamination shall be removed from the surface before painting.
 - b. Spot prime rusty areas on the steel prior to coating with PPG 6-208 Speedhide Interior Exterior Rust Inhibitive Steel Primer.
 - c. Prime bare steel areas with PPG 6-208 Speedhide Interior Exterior Rust Inhibitive Steel Primer (if ferrous metal) or with PPG 90-712 Pitt-Tech Int./Ext. Primer/Finish DTM Industrial Enamel (if galvanized steel).
 - d. Follow all additional surface preparation guidelines on technical data sheets.
 2. First coat (Primer) (Full coat over spot primer recommended above): PPG; 17-921 Series Seal Grip Interior Exterior Universal Acrylic Primer @ 1.6 mils DFT.
 3. Second coat: PPG; 90-1210 Series Pitt-Tech® Plus Int./Ext. DTM Industrial Semi Gloss Enamel @ 2.0 – 4.0 mils DFT.
 4. Third coat: PPG; 90-1210 Series Pitt-Tech® Plus Int./Ext. DTM Industrial Semi Gloss Enamel @ 2.0 – 4.0 mils DFT.

- J. Metal building panels (Previously painted) – Metal siding (Heavily chalked):
1. Surface preparation: Surfaces must be rendered clean, dry and free from dirt, loose paint, oil, grease, chalk, wax, rust, loose mill scale and any other contamination per method SSPC-SP2 or SP3 Hand Tool or Power Tool Cleaning.
 - a. Removal of chalk residue must be addressed specifically.
 - b. Dull glossy surfaces by sanding or best available means. Sanding dust and residual contamination shall be removed from the surface before painting.
 - c. Spot prime rusty areas with PPG 6-208 Speedhide Interior Exterior Rust Inhibitive Steel Primer.
 - d. Prime bare steel areas with PPG 6-208 Speedhide Interior Exterior Rust Inhibitive Steel Primer (if ferrous metal) or with PPG 90-712 Pitt-Tech Int./Ext. Primer/Finish DTM Industrial Enamel (if galvanized steel).
 - e. Follow additional surface preparation guidelines on technical data sheets.
 2. First coat (Primer) (Full coat over spot primer recommended above): PPG; 4-808/809 Series Perma Crete Interior/Exterior Acrylic Masonry Surface Sealer @ 1.3 mils DFT.
 3. Second coat: PPG; 90-1210 Series Pitt-Tech® Plus Int./Ext. DTM Industrial Semi Gloss Enamel @ 2.0 – 4.0 mils DFT.
 4. Third coat: PPG; 90-1210 Series Pitt-Tech® Plus Int./Ext. DTM Industrial Semi Gloss Enamel @ 2.0 – 4.0 mils DFT.
- K. Concrete masonry units (Previously painted):
1. Surface preparation: Surface must be clean, dry and free from dirt, loose paint, oil, grease, wax, chalk, efflorescence, mildew, dust, excess or splattered mortar, and other contamination.
 - a. Damaged areas and moisture sources shall be repaired and corrected prior to priming and painting.
 - b. Sand painted surfaces to dull existing gloss. Following sanding, remove sanding dust from surface.
 - c. Following removal of loose and peeling paint, spot fill bare block areas prior to priming.
 - d. Follow additional surface preparation guidelines on technical data sheets.
 2. Block filler (Spot fill BARE BLOCK ONLY): PPG; 6-7 Series Speedhide Interior Exterior Masonry Latex Block Filler applied at the spread rate required to fill the pores of the block.
 3. First coat (Primer): PPG; 17-921 Series Seal Grip Interior Exterior Acrylic Universal Primer @ 1.6 mils DFT.
 4. Second coat: PPG; 4-22 Perma-Crete High Build 100% Acrylic Topcoat @ 3.2 to 5.8 mils DFT.
 5. Third coat: PPG; 4-22 Perma-Crete High Build 100% Acrylic Topcoat @ 3.2 to 5.8 mils DFT.

3.4 INTERIOR PAINT SCHEDULE:

- A. Concrete (Other Than Concrete Unit Masonry): Provide the following paint systems over interior concrete and brick masonry substrates:
 - 1. Flat acrylic finish:
 - a. First coat: PPG; 4-603 Perma-Crete Int/ Ext Alkali Resistant Primer (88 g/L VOC); 1.2 to 1.5 Dry Mils.
 - b. Second coat: PPG; 6-70 Series SpeedHide Interior Wall Flat Latex (<50 g/L VOC); 1.3 Dry Mils.
 - c. Third coat: PPG; 6-70 Series SpeedHide Interior Wall Flat Latex (<50 g/L VOC); 1.3 Dry Mils.

- B. Concrete masonry unit: Provide the following finish systems over interior concrete masonry:
 - 1. Semi-gloss acrylic-enamel finish:
 - a. First coat: PPG; 6-7 SpeedHide Int/Ext Masonry Block Filler Latex (<50 g/L VOC); 7.1 Dry Mils.
 - b. Second coat: PPG; 6-500 Series SpeedHide Interior Semi-gloss Acrylic Latex (<50 g/L VOC); 1.4 Dry Mils.
 - c. Third coat: PPG; 6-500 Series SpeedHide Interior Semi-gloss Acrylic Latex (<50 g/L VOC); 1.4 Dry Mils.

- C. Gypsum board: Provide the following finish systems over interior gypsum board surfaces:
 - 1. Flat acrylic finish:
 - a. First coat: PPG; 6-2 SPEEDHIDE Interior Latex Sealer Quick-Drying (<50 g/L VOC); 1.0 Dry Mils.
 - b. Second coat: PPG; 6-70 Series SpeedHide Interior Wall Flat Latex (<50 g/L VOC); 1.3 Dry Mils.
 - c. Third coat: PPG; 6-70 Series SpeedHide Interior Wall Flat Latex (<50 g/L VOC); 1.3 Dry Mils.
 - 2. Low-luster acrylic finish:
 - a. First coat: PPG; 6-2 SPEEDHIDE Interior Latex Sealer Quick-Drying (<50 g/L VOC); 1.0 Dry Mils.
 - b. Second coat: PPG; 6-411 Series SpeedHide Interior Enamel Eggshell Latex (<50 g/L VOC); 1.5 Dry Mils.
 - c. Third coat: PPG; 6-411 Series SpeedHide Interior Enamel Eggshell Latex (<50 g/L VOC); 1.5 Dry Mils.

- D. Wood: Provide the following paint finish systems over new interior wood surfaces:
 - 1. Semi-gloss acrylic-enamel finish:
 - a. First coat: PPG; 17-951 PPG SEAL GRIP Interior Primer/Finish (45 g/L VOC); 1.2 Dry Mils.
 - b. Second coat: PPG; 6-500 Series SpeedHide Interior Semi-gloss Acrylic Latex (<50 g/L VOC); 1.5 Dry Mils.
 - c. Third coat: PPG; 6-500 Series SpeedHide Interior Semi-gloss Acrylic Latex (<50 g/L VOC); 1.5 Dry Mils.

- E. Ferrous metal: Provide the following finish systems over ferrous metal:
 - 1. Semi-gloss acrylic-enamel finish:
 - a. First coat: PPG; 90-712 Series Pitt-Tech Int/Ext Industrial DTM Primer/Finish Enamel (123 g/L VOC compliant as anti-corrosive product); 2.0 to 3.0 Dry Mils.
 - b. Second coat: PPG; 6-500 Series SpeedHide Interior Semi-gloss Acrylic Latex (<50 g/L VOC); 1.5 Dry Mils.
 - c. Third coat: PPG; 6-500 Series SpeedHide Interior Semi-gloss Acrylic Latex (<50 g/L VOC); 1.5 Dry Mils.

- F. Zinc-coated metal: Provide the following finish systems over interior zinc-coated metal surfaces:
 - 1. Semi-gloss acrylic-enamel finish:
 - a. First coat: PPG; 90-712 Series Pitt-Tech Int/Ext Industrial DTM Primer/Finish Enamel (123 g/L VOC compliant as anti-corrosive product); 2.0 to 3.0 Dry Mils.
 - b. Second coat: PPG; 6-500 Series SpeedHide Interior Semi-gloss Acrylic Latex (<50 g/L VOC); 1.5 Dry Mils.
 - c. Third coat: PPG; 6-500 Series SpeedHide Interior Semi-gloss Acrylic Latex (<50 g/L VOC); 1.5 Dry Mils.

- G. Aluminum: Provide the following finish systems over interior zinc-coated metal surfaces:
 - 1. Semi-gloss acrylic-enamel finish:
 - a. First coat: PPG; 90-712 Series Pitt-Tech Int/Ext Industrial DTM Primer/Finish Enamel (123 g/L VOC compliant as anti-corrosive product); 2.0 to 3.0 Dry Mils.
 - b. Second coat: PPG; 6-500 Series SpeedHide Interior Semi-gloss Acrylic Latex (<50 g/L VOC); 1.5 Dry Mils.
 - c. Third coat: PPG; 6-500 Series SpeedHide Interior Semi-gloss Acrylic Latex (<50 g/L VOC); 1.5 Dry Mils.

- H. Dry fog coating for exposed structural system, including joists, beams and metal decking; alkyd enamel; number of coats specified are minimum:
 - 1. First coat:
 - a. Ferrous metals: 90-712 Series PPG Pitt Tech Interior/Exterior DTM Waterborne Acrylic Primer/Finish.
 - b. Galvanized metals and aluminum: No primer required.
 - 2. Second coat: 6-725 XI Speedhide Interior Super Tech WB Acrylic Dry-Fog Flat Finish.
 - 3. Third coat: 6-725 XI Speedhide Interior Super Tech WB Acrylic Dry-Fog Flat Finish.

End of Section

SECTION 10 1400

SIGNAGE

PART 1 - GENERAL

1.1 SUBMITTALS:

- A. Product data: Submit product data showing material proposed. Submit sufficient information to determine compliance with the Drawings and Specifications. Product data shall include, but shall not be limited to, manufacturer's construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of sign required.
- B. Shop drawings: Submit shop drawings for each product and accessory required. Include information not fully detailed in manufacturer's standard product data, including, but not limited to, plans, elevations, and large scale sections of members, materials, shapes, sizes, finishes, and other components. Show anchors, accessories, layout, and fabrication and installation details.
 - 1. Provide message list for each sign required, including, but not limited to, large scale details of wording and layout of lettering.
 - 2. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of work in other sections.
- C. Samples: Submit samples for verification purposes. Submit samples of each color, pattern, and texture selected, as follows:
 - 1. Cast acrylic sheet: Submit a sample panel not less than 8-1/2 inches by 11 inches for each material indicated. Include a panel for each color, texture, and pattern required. On each panel include a representative sample of the graphic image process required, showing graphic style, and colors and finishes of letters, numbers, and other graphic devices.
- D. Qualification data: Submit qualification data for firms specified herein to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names of architects and owners, and other information specified.
- E. Maintenance data: Furnish maintenance manual to instruct the Owner's personnel in procedures to be followed in operating, cleaning, and maintaining the work. Provide manufacturer's brochures describing the actual materials used in the work, including, but not limited to, metal alloys, finishes, and other major components.

1.2 QUALITY ASSURANCE:

- A. Applicable standards:
 - 1. Americans with Disabilities Act (ADA).
- B. Qualifications:
 - 1. Manufacturer qualifications: Manufacturer shall be a firm engaged in the manufacture of signs of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of five years.
 - 2. Installer qualifications: Installer shall be a firm that shall have a minimum of five years of successful installation experience with projects utilizing signs similar in type and scope to that required for this Project.

- C. Regulatory requirements:
 - 1. Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.
 - 2. Comply with applicable requirements of the ADA and ANSI A117.1.
- D. Sole source responsibility: For each separate type of sign required, obtain sign from a single source with resources to produce products of consistent quality in appearance and physical properties without delaying the work.

1.3 DELIVERY, STORAGE AND HANDLING:

- A. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and lot number, if any.
- B. Deliver signs for interior installation only after building is enclosed and designated areas are ready to receive work.
- C. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
- D. Cover or otherwise protect finished surfaces from damage or stains for remainder of work.

1.4 PROJECT CONDITIONS:

- A. Field measurements: Take field measurements prior to fabrication of the work and preparation of shop drawings, to ensure proper fitting of the work.
 - 1. Show recorded measurements on final shop drawings.
 - 2. Notify the Owner and the Architect, in writing, of any dimensions found which are not within specified dimensions and tolerances, prior to proceeding with the fabrication.
 - 3. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1.5 WARRANTIES:

- A. Warranty: Warrant signage as herein specified to be free from defects in materials and workmanship for a period of five (5) years from Date of Substantial Completion.
- B. Finish warranty:
 - 1. Submit a written warranty, signed by manufacturer, covering failure of the factory-applied finish within the specified warranty period and agreeing to repair finish or replace work that shows evidence of finish deterioration.
 - 2. Deterioration of finish includes, but shall not be limited to, color fade, chalking, cracking, peeling, and loss of film integrity. Warranty period shall be 20 years from Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SIGNAGE, GENERAL:

- A. Accessibility standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.

2.2 MANUFACTURERS:

- A. Acceptable manufacturers:
 1. APCO Graphics, Inc., Arcadia Curved Face Sign System.
 2. ASI-Modulex, Inc.
 3. A.R.K. Ramos Signage Systems.
 4. Best Sign Systems, Inc.
 5. Gemini, Inc.
 6. Innerface Sign Systems, Inc.
 7. Matthews International Corp.
 8. The Southwell Co.

2.3 MATERIAL:

- A. System requirements:
 1. General:
 - a. Sign system shall feature solutions for all required sign types, including but not limited to wall mounted personnel signs, work station personnel signs, primary room identification, directories, directional, overhead signs, projection wall signs, free standing signs, restroom signs, regulatory and information signs, stair signs and changeable slide conference room signs.
 - b. Signs within the system shall feature the same family of components and convey a uniform look throughout.
- B. Features:
 1. Updatibility: Signs shall allow for easy updating of message inserts without the need to replace the entire sign assembly. System shall offer a solution for easy in-house updating of laser printed sign inserts for all sign types, including personnel signs, directories and directional signs.
 2. Mounting: Signs shall accommodate installation via fully concealed mechanical fasteners.
- C. Graphics and typography: As selected from manufacturer's standards. Reference sign drawings.
- D. Colors and finishes: As selected from manufacturer's full range. Reference sign drawings.
- E. ADA Compliance: Sign system shall comply with all applicable provisions of the 2010 Standards for Accessible Design (the updated ADA Accessibility Guidelines, ADAAG), effective in March 2011. This includes requirements regarding which sign types require Braille/tactile features, character heights, raised character spacing, raised character stroke width, color contrast and installation locations and mounting heights within the facility.

- F. Materials and Construction:
1. Frames/holders: Curved face sign frames shall be constructed of extruded aluminum, alloy 6063-T6, with minimum 3/4 inch (19 mm) wide contour edge detail. Top/bottom caps shall be aluminum. Plastic caps will not be acceptable. Aluminum extrusions shall contain a minimum of 50% post consumer recycled content and shall be extruded in the USA. Modular sign holders shall accommodate any type of flexible insert material up to .095 inch (2.4 mm) thick.
 2. Braille / Tactile Components: PETG-backed photopolymer with raised characters and Braille of minimum 1/32 inch (0.8 mm) depth/thickness. Braille/tactile plaques shall contain a minimum of 40% recycled content.
 3. Fasteners: Signs shall be able to accommodate fully concealed mechanical fasteners.

2.4 SIGN SYSTEM COMPONENTS

- A. Curved-Face Arcadia Sign System. Reference drawings for location of colors, finishes, sizes and details. Reference signage schedule for sign text.
1. Arcadia Series 1000 (Contour Profiles at Left/Right of Sign).
 2. Frame finish: As selected by Architect from manufacturer's product data.
 3. Frame Sizes (widths): As selected by Architect from manufacturer's full range.
 4. Insert/Display components to include: As selected by Architect from manufacturer's full range.
 5. Decorative display components to include: As selected by Architect from manufacturer's full range.
 6. Decorative dividers to include: As selected by Architect from manufacturer's full range.
 7. Mounting/installation types to include: Surface Wall Mount with Vinyl Tape (VT).
- B. Graphics:
1. Type sizes: As selected by Architect from manufacturer's full range; meet ADA requirements for letter proportions and sizes.
 2. Typography: Reference signage schedule and drawings for details. Font(s) selected from manufacturer's full range unless otherwise specified. All text and graphics shall be a true representation of the typeface(s) and/or graphics specified. Letter spacing and interline spacing shall be set by the manufacturer.
 3. Typeface(s) as indicated in SCHEDULES Article and Drawings.
 - a. Type Code(s): Uppercase.
 - b. Imprint Colors: Selected by Architect from manufacturer's standard 40 non-glare screening ink colors per unit and indicated in SCHEDULE; color contrast background colors in accord with ADA requirements.
 - c. Copy/Message List: Indicated in SCHEDULE.
 - d. Reference drawings and Signage Schedule for details.
 - e. All text and graphics shall be a true representation of typeface(s) and/or graphics specified.

2.5 FABRICATION

- A. Shop assembly:
1. Fabricate units to configurations indicated on reviewed shop drawings.
 2. Provide copy on inserts, and covers required on reviewed shop drawings and in accord with ADA requirements.
 3. Provide additional blank paper as specified.

4. Include instruction sheets for removal and replacement inserts and installation.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Verification of conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Architect, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION:

- A. General:
 1. Locate signs and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions. Complete installation shall be in accordance with manufacturer's printed instructions and final shop drawings, to produce work complying with the Contract Documents.
 2. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
- B. Mounting heights above finish floor: As indicated on drawings. Comply with ADA requirements.

3.3 ADJUSTING AND CLEANING:

- A. Neatly repair minor blemishes or marring on finished surfaces so that repairs are imperceptible. Completely replace components having permanent non-removable scratches, stains, or other defacement.
- B. Upon completion of the work, remove unused materials, debris, containers, and equipment from the Project site. Remove protective coverings and clean the exposed surfaces of the work to remove dirt, stains, and other substances, by methods as recommended by manufacturer.

3.4 PROTECTION:

- A. Provide final protection and maintain conditions in a manner acceptable to the installer that shall ensure that the signs shall be without damage at time of Substantial Completion.

End of Section

SECTION 10 2813
TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY:

- A. Related work specified elsewhere:
 - 1. Concrete unit masonry.
 - 2. Gypsum board.
 - 3. Toilet compartments.

1.2 DESIGN CRITERIA:

- A. In order to be acceptable, products shall comply with the following criteria:
 - 1. All accessories shall be products of a single manufacturer.
 - 2. Keying: Keyed accessories shall be keyed alike, unless otherwise specified.
 - 3. Operation: Control and operating mechanisms shall be operable with one hand, without tight grasping, pinching, or twisting of wrist, and with a maximum force of 5 lbf.
 - 4. Cabinet construction:
 - a. Material: Entire cabinet shall be constructed of 18-8 S, Type 304 stainless steel, minimum 22 ga., except that doors of flush face cabinets shall be minimum 18 ga.
 - b. Finish: Satin finish, vertical grain stainless steel; matching in color and graining within the same cabinet.
 - c. Unit construction: Seamless or welded; welds ground smooth prior to finishing on exposed surfaces. Cabinets shall have full, continuous backs and sides. Flush face units shall be seamless construction.
 - d. Hinges: Doors shall be hung on continuous stainless steel piano hinges.
 - e. Stops: Doors shall have spring or cable stops located inside cabinet to limit opening to 120 degrees maximum.
 - f. Bumpers: Doors shall have rubber bumpers to cushion door closing.
 - g. Exposed edges: Hemmed, returned or flanged; sharp edges not allowable.
 - h. Waste receptacle liners: Rigid, leakproof, molded plastic.
 - i. Paper towel dispensers: Adaptable to dispense C-fold, multi-fold or single-fold towels without use of additional towel trays.
 - j. Feminine napkin/tampon vendors: Changeable coin mechanisms and coin slot identification; lockable coin box keyed differently from other accessories.
 - 5. Soap dispensers:
 - a. Valves: All-purpose dispensing type; piston and exposed components of Type 302/304 stainless steel or chrome-plated brass.
 - b. Lavatory-mounted dispensers: Capable of being filled from top, without removal of container.
 - c. Lavatory dispenser container: Minimum 32 oz. capacity, rigid polyethylene.

1.3 SUBMITTALS:

- A. Product data: Include catalog cuts and data sheets indicating size, material and finish, complete parts list and installation procedures for each accessory. Where manufacturer's standard products vary with design criteria, indicate compliance with design criteria.
- B. Samples: Submit one actual sample of each accessory for approval if requested by Architect. Upon approval, samples will be returned for incorporation into project.

1.4 QUALITY ASSURANCE:

- A. Applicable standards; comply with the following as referenced herein: Americans with Disabilities Act (ADA).

1.5 PROJECT/SITE CONDITIONS:

- A. Protection: Maintain manufacturer's protective covering on accessories until final cleanup of installation.
- B. Coordinate this work with work of other trades into which accessories are to be installed.

1.6 WARRANTY:

- A. Mirrors: Warrant mirrors for five years against silver spoilage.

PART 2 - PRODUCTS

2.1 TOILET ACCESSORIES:

- A. Acceptable manufacturers; subject to compliance with specified design criteria:
 - 1. AJW Architectural Products.
 - 2. American Specialties, Inc. (ASI).
 - 3. Bobrick Washroom Equipment, Inc.
 - 4. Bradley Washfountain Co.
- B. The basis of design for toilet accessories is scheduled on drawings. Toilet accessories of similar design and construction, as manufactured by other acceptable manufacturers, may be submitted for Architect's consideration. Acceptance is subject to compliance with specified design criteria, as evidenced by submittal of specified product data, and Architect's approval.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Check opening scheduled to receive recessed or semi-recessed accessories for correct dimensions, depth, plumbness of blocking or frames, and preparation that would affect installation of accessories.

3.2 INSTALLATION:

- A. Install accessories level, plumb and in indicated location. Installation methods shall be as indicated in product data for substrates encountered. Securely attach to blocking or framing members.
- B. Mounting heights: As indicated on drawings and meeting ADA accessibility requirements.
- C. Grab bars:
 - 1. Secure grab bars to wood by direct attachment to blocking installed between studs.
 - 2. Secure grab bars to metal stud partition by direct attachment to steel studs, using 1/4" diameter toggle bolts, or using minimum 12 ga. by 3" wide steel anchor plates, continuous length required for attachment of grab bar flanges.
 - a. Attach anchor plates to studs on grab bar side of wall, using self-tapping sheet metal screws.
 - b. Where grab bar flanges mount on separate walls, anchor plate shall be of length to span between studs at individual flange locations.
 - c. Attach grab bars to anchor plates using stainless steel machine screws.
 - 3. Attach grab bars to masonry walls using concealed mounting plate, minimum 1/4" diameter through-bolt and minimum 10 ga. steel backup plate.
 - 4. Attach grab bars to concrete walls using 1/4" diameter stainless steel machine screws and metal expansion shields.
 - 5. Attach grab bars to toilet partitions using wing tapped steel spacers and stainless steel machine screws. Where grab bar is attached to one side of partition only, spacer shall have minimum 16 ga. satin finish stainless steel backup plate.
- D. Conceal evidence of drilling, cutting and fitting to adjacent finishes.

3.3 ADJUSTING AND CLEANING:

- A. Adjust operating parts of accessories for proper operation.
- B. Clean and polish exposed surfaces prior to Date of Substantial Completion.
- C. Deliver accessory schedule, keys and parts manual as part of project closeout documents.

End of Section

SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY:

- A. Related work specified elsewhere:
 - 1. Gypsum board systems.
 - 2. Concrete unit masonry.
 - 3. Painting and coating.

1.2 SUBMITTALS:

- A. Shop drawings: Indicate extinguisher location, size, mounting height and method of installation. Show cabinet installation details, including fire protection enclosure where cabinet is located in fire-rated wall assembly.
- B. Product data: Indicate material types, finishes, ratings, hardware, sizes, fabrication and installation details. Include sample of cabinet door sign.

1.3 QUALITY ASSURANCE:

- A. Applicable standards; standards of the following as referenced herein:
 - 1. ASTM International (ASTM).
 - 2. Americans with Disabilities Act (ADA).
 - 3. Factory Mutual (FM).
 - 4. Underwriters Laboratories, Inc. (UL).
 - 5. Inchcape Testing/Warnock Hersey (WH).

1.4 DELIVERY, STORAGE AND HANDLING:

- A. Deliver and store in protective packaging to prevent soiling and physical damage.
- B. Handle to prevent damage to finished surfaces and operating mechanisms.

1.5 PROJECT/SITE CONDITIONS:

- A. Protection: Protect prefinished surfaces from damage or staining. Provide protective covering following installation for duration of project.

1.6 INSPECTION SERVICE:

- A. Extinguishers shall have an inspection certification tag attached, indicating date of charge and service agent's name and address. Charge date shall not be earlier than sixty days prior to Date of Substantial Completion. Service agent shall be located within 50 miles of project.
- B. Provide an inspection service agreement for inspection and servicing of extinguishers for one year following date of initial charge, as well as for servicing and recharging extinguishers failing to hold charge within the initial one-year period. Recharging extinguishers due to use or vandalism shall not be included in service agreement.

PART 2 - PRODUCTS

2.1 PORTABLE FIRE EXTINGUISHERS:

- A. Acceptable manufacturers; subject to compliance with specified requirements:
 - 1. J. L. Industries, Inc., an Activar Construction Products Group, Inc. Company.
 - 2. Larsen Manufacturing Co.
 - 3. Nystrom, Inc.
 - 4. Potter Roemer - Fire Protection Equipment, a division of Morris Group International.
- B. Dry chemical type in steel container: UL-rated 4A:80B:C, 10-lb nominal capacity, multi-purpose dry chemical in enameled-steel container.
- C. Container characteristics:
 - 1. Label: UL and FM.
 - 2. Accessories: Pressure-indicating gauge, hose and nozzle.
 - 3. Operation: Pull-pin and squeeze grip for multiple controlled release.

2.2 FIRE EXTINGUISHER BRACKETS:

- A. Description: Manufacturer's standard wall bracket designed to support extinguisher securely in vertical position on wall or centered in cabinet.

2.3 TRIMMED SEMI-RECESSED AND RECESSED CABINETS:

- A. Acceptable products; subject to compliance with specified requirements:
 - 1. J. L. Industries, Inc., an Activar Construction Products Group, Inc. Company, Ambassador.
 - 2. Larsen's Manufacturing Co., Architectural Series.
 - 3. Nystrom, Inc., Alpine Series.
 - 4. Potter Roemer - Fire Protection Equipment, a division of Morris Group International., Alta Series.
- B. Characteristics:
 - 1. Type: Recessed and semi-recessed cabinet as required to fit construction conditions.
 - 2. Cabinet: Minimum 20 ga. cold-rolled steel, one-piece formed construction, prefinished in manufacturer's standard white baked enamel.
 - 3. Size: Coordinate cabinet size to accept fire extinguisher.
 - 4. Door:
 - a. Style: Solid panel.
 - b. Construction: Roll-formed, one-piece tubular construction formed from minimum 20 ga. cold-rolled steel, baked enamel coating suitable for receipt of field paint finish.
 - 5. Trim:
 - a. Type: Maximum 1-1/2" square projecting corner trim semi-recessed installation.
 - b. Trim construction: Roll-formed, one-piece tubular construction formed from minimum 20 ga. cold-rolled steel, baked enamel coating suitable for receipt of field paint finish.
 - 6. Hardware: Full length piano hinge, roller catch.
 - 7. Pull: Pulls shall comply with ADA requirements. Provide manufacturer's standard pull handle.

8. Lettering: "FIRE EXTINGUISHER" decal or vinyl, self-adhering, pre-spaced lettering in size, color and vertical or horizontal orientation as selected by Architect. Supplied loose for application following field painting.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Coordination: Coordinate installation of built-in cabinets with wall construction.

3.2 CABINET INSTALLATION:

- A. Install cabinets plumb and level, anchored to structural elements using not less than two anchors, each, top and bottom of each cabinet. Anchors shall be type and size recommended by cabinet manufacturer for substrate encountered, concealed within closed cabinet, with exposed heads finished to match cabinet interior.
- B. Provide blocking built into walls at anchorage locations.
- C. Where cabinet is installed in a fire-rated wall assembly, provide fire-rated wall construction around cabinet.
- D. Conceal edges of rough opening into which cabinet is installed with cabinet assembly.
- E. Mounting heights: As indicated on drawings and as follows:
 1. Maximum forward reach to equipment shall be 4'-0" above finished floor level.
 2. Maximum side reach to equipment shall be 4'-6" above finished floor level.
 3. Mounting heights shall meet ADA and NFPA requirements.
- F. Finishing:
 1. Paint exposed surfaces of cabinet door and trim as specified in Painting and Coating section; colors as selected by Architect.
 2. Apply "Fire Extinguisher" lettering to finished door. Lettering shall be straight, true and accurately spaced and aligned, free of wrinkles, bubbles, tears or other imperfections.

3.3 EXTINGUISHER INSTALLATION:

- A. Install extinguishers at Date of Substantial Completion, indicating acceptable charge pressure and tagged to show charge date and service agent.
- B. Install wall-hung extinguishers on wall mounting bracket. Secure bracket to wall structure with not less than two anchors.
- C. Mounting heights: As indicated on the drawings and as follows:
 1. Maximum forward reach to equipment shall be 4'-0" above finished floor level.
 2. Maximum side reach to equipment shall be 4'-6" above finished floor level.
 3. Mounting heights shall meet ADA and NFPA requirements.

- D. Install cabinet-mounted extinguishers in cabinets using wall mounting bracket attached to back wall of cabinet.
- E. Install and secure extinguishers in plumb, vertical position with name and operating instructions visible on front of extinguisher.

3.4 CLEANING AND PROTECTION:

- A. Protect installed equipment and finished surfaces from damage or defacement. Replace items which cannot be repaired to satisfaction of Architect.
- B. Prior to date of Substantial Completion, clean and polish interior and exterior surfaces.

3.5 EXTINGUISHER SCHEDULE:

- A. Provide 10 lb. multi-purpose type extinguishers in recess or semi-recess mounted cabinet in locations as indicated or as directed by Architect.

End of Section

SECTION 10 5113

METAL LOCKERS

PART 1 - GENERAL

1.1 SUBMITTALS:

- A. Shop drawings: Indicate locker layout, methods of attachment and accessory items and hardware. Include proposed numbering system for each locker room.
- B. Product data: Submit copies of manufacturer's product specifications and installation instructions.
- C. Color samples: Submit manufacturer's color chips for color selection by Architect.

1.2 DELIVERY, STORAGE AND HANDLING:

- A. Deliver lockers only after closing in of building.
- B. Handle products to prevent bending, racking or otherwise damaging lockers. Protect prefinished surfaces from marring. Damaged products shall not be installed and shall be removed from project site.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS:

- A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

2.2 STANDARD LOCKERS:

- A. Acceptable manufacturers; subject to compliance with specified requirements:
 - 1. AJW Architectural Products.
 - 2. ASI Storage Solutions Inc.
 - 3. List Industries, Inc.
 - 4. Lyon Metal Products, Inc.
 - 5. Penco Products, Inc.
 - 6. Republic Storage Systems LLC.
- B. Locker types and sizes: Single-tier: 12" wide by 18" deep by 72" high.
- C. Characteristics:
 - 1. Locker body: Minimum 24 ga. cold-rolled sheet steel, flanged at connections of sides, back, top and bottom. Locker body shall be assembled with galvanized steel bolts spaced at 9" o. c., maximum.
 - 2. Door frame: Minimum 16 ga. cold-rolled steel, welded construction, formed with integral door strike.
 - 3. Door: Minimum 16 ga. cold-rolled sheet steel.
 - a. Lockers shall have door edges formed with right angle flanges on horizontal edges; channel shaped on vertical edges.
 - 4. Sloping hoods, closure panels, and similar accessories: Minimum 24 ga. cold-rolled steel; exposed edges flanged.

- D. Hardware:
1. Latching device: Spring-actuated slide latch engaging latch hooks on door frame. Slide latch shall be enclosed in door assembly but be removable for service or replacement.
 2. Latch hooks: Fabricated of minimum 13 ga. cold-rolled steel. Provide three latch hooks.
 3. Rubber silencers: Provide one silencer at each latch hook.
 4. Handle for locker doors: Lift type metal controlling latching device; chrome-plated finish. Attach handle to door assembly with fasteners concealed on door exterior. Handle shall have integral padlock eye.
 5. Hinges: 2" by 0.050" thickness, five-knuckle full loop with non-removable pin, attached to door and frame; three per door.
 6. Coat hooks: Manufacturer's standard design. Provide one double-prong ceiling hook and three single-prong wall-mounted hooks per locker; bolt-attached.
 7. Number plates: Factory-installed aluminum with 3/8" high etched numerals.
- E. Locking provisions: Latching device prepared to receive padlocks.
- F. Finish for locker components: Manufacturer's standard 2 mil thickness, baked enamel or powder coat finish, applied over phosphate-treated steel, colors selected by Architect from manufacturer's full range. A maximum of two colors may be used.
- G. Ventilation: Six louvers at top and bottom of each door.
- H. Bases: 6" high legs with closure panels.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Assemble and install lockers at locations indicated, plumb, level and rigid. Secure lockers to walls using 1/4" toggle bolts spaced at 2'-0" o. c., horizontally.
- B. Locker doors shall operate without sticking or binding. Test hardware for proper operation.
- C. Clean finished surfaces just prior to Date of Substantial Completion. Touch up minor scratches to match prefinished surfaces.

End of Section

SECTION 10 7316

CANOPIES

PART 1 - GENERAL

1.1 SUMMARY:

- A. Work of this section includes pre-fabricated, simple-span aluminum canopy construction at locations indicated on drawings.

1.2 PERFORMANCE REQUIREMENTS:

- A. Delegated design: Engage a professional engineer registered in the state of Georgia, to design canopies.
- B. Structural performance: Canopies, including anchorages and supports, shall withstand live, dead and superimposed loads as indicated on structural drawings in accord with requirements of International Building Code, 2006 Edition, within limits and under conditions indicated.
 - 1. Maximum allowable deflection of framing: $L/240$.
- C. Seismic performance: Canopies shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- D. Thermal movement: Completed canopy systems shall be capable of withstanding expansion and contraction of components caused by an ambient temperature range of 120 degrees F and material surface temperature change of 180 degrees F without buckling, excess stress on framing structure or adjacent structures, anchors or fasteners. Base design calculation on actual surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.
- E. Anchors: Capable of transmitting design loads and thermal expansion loads assigned to a single anchor; with a safety factor of 2.5.

1.3 SUBMITTALS:

- A. Shop drawings: Indicate canopy structure in elevation and plan with sections and details at full scale. Include metal thicknesses, joining details, field connections, anchorage, provisions for expansion, fastening and sealing methods and metal finishes. Indicate relationships with adjacent and interfacing work. Shop drawings shall bear the seal of the professional engineer responsible for providing engineering services as specified herein.
- B. Product data: Include full system and material description, finish and installation instructions.
- C. Samples:
 - 1. Submit minimum 1'-0" length of typical support members, beams, fascia and decking components.
 - 2. Submit minimum 6" by 6" samples, finished as specified, indicating range of finish color and texture to be expected in the finished work.
- D. Structural design calculations: Submit for canopy system. Indicate compliance with specified design criteria. Design calculations shall bear seal of the professional engineer responsible for providing engineering services as specified herein.

- E. Test certification: If requested by Architect, submit certification and results of independent tests verifying compliance with design criteria.
- F. Maintenance data: Submit as part of contract closeout documents. Give instructions for general maintenance and repair of surfaces and finishes.

1.4 QUALITY CRITERIA:

- A. Applicable standards: Standards of ASTM International (ASTM); as referenced herein.
- B. Fabricator qualifications: Fabricator shall be a firm with minimum ten years experience successfully producing canopies similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.
- C. Installer qualifications: Erection shall be performed by manufacturer or by an erector with minimum five years experience installing prefabricated canopies.
- D. Engineer qualifications: Engineering shall be performed by a professional engineer licensed in the State of Georgia and experienced in providing engineering services of the kind indicated that have resulted in successful installation of canopies of similar material, design and extent to that indicated for this Project.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Do not deliver canopy systems to site until time for installation.
- B. Erect canopy systems following completion of adjacent construction.
- C. Protect materials from physical damage, staining or other harm to material or finish.

1.6 SEQUENCING:

- A. Coordinate installation of canopy with adjacent construction required to be built into building structure. Secure templates or lay out to rough dimensions provided by canopy manufacturer.

1.7 WARRANTY:

- A. Manufacturer's warranty: Provide a two year written warranty covering defective materials, workmanship and performance and providing for repair of canopy system at no additional cost to Owner. Warranty period shall begin at Date of Substantial Completion.
- B. Finish warranty: Provide manufacturer's five year finish warranty covering refinishing of fluoropolymer coating due to checking, crazing, peeling, chalking or fading, beginning at Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PREFABRICATED CANOPY SYSTEM:

- A. Acceptable manufacturers, subject to compliance with specified characteristics:
 - 1. Dittmer Architectural Aluminum Co.
 - 2. E.L. Burns Company, Inc.
 - 3. Mapes Industries, Inc.
 - 4. Perfection Architectural Systems, Inc.
- B. Column supported canopy system:
 - 1. Extruded aluminum structural and decking system in length to span minimum two bays. Roll-formed sheet decking and accessory components will not be acceptable. Decking components shall interlock without visible joint lines on horizontal surfaces.
 - 2. System shall drain to continuous fascia-gutter sections providing a minimum 6" depth and ten square inches of gutter area.
 - 3. Gutter shall drain through tubular columns containing baffle plates to divert water through outside face at grade.
 - 4. Provide internal concealed splices and factory mitered and welded corners.
- C. Aluminum materials:
 - 1. Aluminum extrusions: 6063-T6 aluminum alloy meeting ASTM B221-14 minimum 0.125" wall thickness for structural components, and as indicated by approved engineering design.
 - 2. Aluminum sheet: 5005-H34 aluminum alloy meeting ASTM B209-14; minimum 0.050" thickness.
 - 3. Fasteners: Hardened aluminum or stainless steel. Exposed fasteners shall be countersunk and shall match canopy in color.
- D. Fluoropolymer coating finish:
 - 1. Two coat, shop-applied, baked-on, fluoropolymer coating system based on minimum 70% Arkema Group, Kynar 500 or Solvay Solexis, Inc., Hylar 5000 resin (Polyvinylidene fluoride, PVDF), formulated by a licensed manufacturer and applied by manufacturer's approved applicator to meet AAMA 2605-05.
 - 2. Color: As selected by Architect from manufacturer's full range.
- E. Bituminous paint for separation of dissimilar materials: Cold-applied asphalt emulsion complying with ASTM D1187-97(2011), minimum 30 mils thickness.

2.2 FABRICATION:

- A. Form work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to radius of approximately 1/32". Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- B. Form profiles without waves or buckling in metal surfaces. Form glazing battens continuous.
- C. Provide anchorage and superstructure of type shown on approved shop drawings and coordinated with supporting steel structure. Fabricate and space anchoring devices as indicated.
- D. Fabricate flashings, closures and similar components indicated to cover structural steel as part of this work.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Inserts and anchorage: Provide inserts and anchoring devices which must be preset in concrete on timely basis to avoid delay in the work. Set at locations indicated on approved shop drawings.
- B. Coordinate setting drawings, diagrams, templates and instructions for installation of concrete inserts, anchor bolts and miscellaneous items having integral anchors cast in concrete construction.

3.2 ERECTION:

- A. Verify location and alignment of preset anchors. Report deviations and proposed method for correction to Architect prior to proceeding.
- B. Fastening to in-place construction: Provide anchorage devices and fasteners for securing items to in-place construction, including threaded fasteners for concrete inserts. Anchor bolts and erection bolts of types and sizes indicated on approved shop drawings.
- C. Set work in location, alignment and elevation, plumb and level within specified tolerances, true and free of rack; measured from established lines and levels. Install work in accord with approved shop drawings.
- D. Protect components from contact with dissimilar materials by separating with concealed neoprene gaskets or bituminous paint. Protect finishes from damage or scratching during installation.
- E. Provide connections as indicated on approved shop drawings. Join dissimilar metal by bolting with galvanic separators.
- F. Caulk perimeter of canopies using silicone sealant as specified in Joint Sealants section. Flash to abutting walls for watertight connection.
- G. Site tolerances:
 - 1. Maximum variation from plumb, level, or designated position: 1/8" in 10'-0" vertical or 1/8" in 20'-0" horizontal .
 - 2. Maximum offset in alignment between two consecutive members in line, end to end: 1/16".
 - 3. Maximum offset between framing members at corners of glazing pocket: 1/32".

3.3 CLEANING:

- A. Cleaning: Maintain canopy assembly in clean condition during construction period. Immediately remove stains or materials having adverse effect on materials and finishes. Remove excess sealant compounds.
- B. Final cleaning: Just prior to Date of Substantial Completion, clean entire canopy assembly using pretested detergent and water. Flush with clean water. Repair or replace work which cannot be cleaned or which has been damaged during construction operations.

3.4 PROTECTION:

- A. Protect canopy and prefinished surfaces from damage or staining until Date of Substantial Completion.

End of Section

SECTION 11 6624

BALLET BARRES

PART 1 - GENERAL

1.1 SUBMITTALS:

- A. Product data: Indicate material types, finishes and sizes, fabrication and installation details and requirements.

1.2 DELIVERY, STORAGE AND HANDLING:

- A. Deliver ballet barres in protective packaging.
- B. Store in packaging to prevent soiling and physical damage.
- C. Handle to prevent damage to finished surfaces and operating mechanisms.

1.3 PROJECT/SITE CONDITIONS:

- A. Protection: Protect prefinished surfaces from damage or staining. Following installation, provide protective covering for ballet barres for duration of project.
- B. Coordinate installation of ballet barres required to be built into building structure. Secure templates or lay out to rough dimensions provided by ballet barre manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Acceptable manufacturers:
 - 1. Basis of design: Ballet Barres, Inc., Single Wall Bracket 501.
 - 2. CFW Flooring, Inc.
 - 3. Gibson Athletic, Inc.

2.2 BALLET BARRES:

- A. Characteristics:
 - 1. Bracket: Welded steel wall mounted bracket system.
 - 2. Barre:
 - a. Material: 1-9/16" diameter solid hardwood Maple.
 - b. Fabricate wood elements from specified hardwoods, pieces being of same cuts and similar grain, and fabricated in accord with AWI Quality Standards.
 - c. Factory finish: Three coats of manufacturer's standard clear polyurethane finish.
- B. Accessories: Provide anchors, fasteners, inserts, sealants and other accessories required for a complete installation and compliance with building code requirements.
 - 1. Provide accessories for mounting through glass mirror to wall framing and blocking.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Install ballet barres through glass mirror in accord with manufacturer's product data, plumb, level and true to line and location.
- B. Protect prefinished surfaces from damage or staining. Clean surfaces prior to Date of Substantial Completion.

End of Section

SECTION 22 0002

PLUMBING SPECIFICATIONS

PART 1 GENERAL

1.1 REGULATORY REQUIREMENTS

- A. Where requirements of these specifications exceed specified codes and ordinances, conform to these specifications.
- B. Materials and equipment included in Underwriters Label Service shall bear that label. Electrical equipment shall be U.L. approved as installed.
- C. Jurisdiction: Where codes or guides refer jurisdiction to local governing code officials, such official in this procedure shall be the City Building Official.
- D. Permits: Obtain all permits, paying all fees in connection therewith. At completion, have work inspected by proper authorities and furnish the Architect for the Owner an inspection certificate showing approval of installation.
- E. Plumbing: Conform to the SBCCI Standard Plumbing Code (International Plumbing Code), 2012 edition, with all Georgia State Amendments.
- F. Fire Prevention Precautions in Cutting and Welding Areas: Conform to Article 2605 Fire Prevention Precautions, SBCCI Standard Fire Prevention Code (International Fire Code), 2012 Edition, with all Georgia State Amendments, for all work involving cutting and welding.
- G. Energy: Conform to the International Energy Conservation Code, 2009 Edition, with all Georgia State Amendments.
- H. Electrical: Refer to Division 26. Conform to the National Electrical Code, NFPA 70, 2014.
- I. Building Code: Conform to the SBCCI Standard Building Code (International Building Code), 2012 Edition with all Georgia State Amendments.

1.2 SUBMITTALS

- A. The contractor shall submit the following for review by the Design Professional.
 - 1. Plumbing Piping Insulation.
 - 2. Plumbing Piping, Fittings and Valves.
 - 3. Plumbing Fixtures and Accessories.
 - 4. Plumbing Specialties
- B. The Contractor may submit using hard-copies or electronically.
 - 1. For hard-copy submittals:
 - a. Provide a minimum of 3 copies, plus the quantity required by the Contractor.

- b. Ensure any reproductions are legible.
 - c. Provide a submittal index.
 - d. Identify the submittal on the cover sheet with the Project Title, Specification Section number and title, and Contractor's and Sub-contractor's company name, along with the contact information for a representative of the Sub-contractor who can answer questions associated with the submittal.
 - e. Provide a date on the cover sheet.
 - f. If the submittal is a "resubmittal", as opposed to the first submittal of a section, indicate such on the submittal cover sheet.
2. For electronic submittals:
- a. Ensure any reproductions are legible.
 - b. Do not scan in color or high resolution unless needed for clarity, to reduce file size.
 - c. Provide a submittal index.
 - d. Send the submittal by email to submittal@nbpengineers.com. Copy the Architect, and Wilson Dent at wdent@nbpengineers.com.
 - e. Identify the submittal in the email subject line with the NBP project number, project title and Spec Section number and title. For example: NBP 15021 Gilead-Bloomfield Complex Renovation Section 220002 Plumbing Specifications. Ensure the cover sheet of the submittal has the same identification.
 - f. Provide a date on the cover sheet of the submittal.
 - g. If the submittal is a "resubmittal", as opposed to the first submittal of a section, indicate such in the email subject line and on the submittal cover sheet.

1.3 QUALITY ASSURANCE

- A. The Contractor expressly warrants that the company performing the installation of the plumbing systems has demonstrated proficiency in the installation and adjustment of such systems by the successful performance of work of the nature specified herein on at least three commercial or institutional buildings, each containing water heating systems, pumping systems (i.e. hot water recirculation, sump pumps, or pressure booster pumps), and a minimum of 10 plumbing fixtures.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years of documented experience.
- C. Products specified this section to be installed in a potable water system anticipated for human consumption shall be in compliance with the amended Safe Drinking Water Act S.3874, to reduce lead in drinking water. "Reduction of Lead in Drinking Water Act". 0.25% allowable lead content.

- D. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

1.4 DELIVERY, STORAGE, AND PROTECTION

- A. Accept all products on site in factory-fabricated protective containers. Inspect for damage.
- B. Store products in a clean dry place and protect from weather and construction traffic.
- C. Handle products carefully to avoid damage to components, enclosures, and finish.
- D. After placement, protect products from damage during construction, by all trade contractors.
- E. Protect equipment nameplates and labels from damage, being painted, scaring, etc.

1.5 WARRANTY

- A. Provide five year manufacturer warranty for electric water cooler from Final Observation.
- B. Warranty: Submit manufacturer warranty and ensure that forms have been completed in the Owner 's name and registered with manufacturer.
- C. Where extended warranties beyond the Contractor's one (1) year warranty are specified, the additional warranty time shall start at the end of the Contractor's warranty.
- D. Correct defective Work for a one year period after Date of Completion.

1.6 INSTALLATION

- A. Clearance above and in front of electrical switchgear, electrical power panels or control panels shall be maintained by mechanical systems so that no pipes, vents, or equipment is routed above or across the space directly above this equipment in conformance with the National Electrical Code.
- B. Install and connect all appliances, equipment, and appurtenances as specified, indicated or required in accordance with the manufacturer's instructions and recommendations. Furnish and install complete auxiliary piping, water seals, valves, electric connections, and similar items, recommended by the manufacturer or as required for proper operation.
- C. Pipe Sleeves in Slabs, Masonry Walls and Partitions:
 - 1. Masonry Partitions: Schedule 40 black steel pipe: Sleeves shall be sized to include the insulation with minimum gap around insulation. Install, without developing a break in the pipe insulation, according to the fire sealant manufacturer's installation instructions for a U.L. Listed assembly for a rated pipe penetration through a rated masonry wall/partition.
 - 2. Omit sleeves in openings core drilled in masonry partitions.
 - 3. Rated Drywall Partitions: Twenty gage galvanized steel. Sleeves shall be sized to include the insulation with minimum gap around the insulation. Install, without developing a break in the pipe insulation, according to the fire sealant manufacturer's installation instructions for a U.L. Listed assembly for a rated pipe penetration through a rated drywall wall/partition.

4. Non-Rated Drywall Partitions: Omit sleeves.

1.7 PIPING PRESSURE TESTS

A. General:

1. Provide 48 hours notification to the Architect in advance of any test.
2. Complete tests prior to insulating. Leaks shall be repaired, defective materials replaced, and system shall be retested. Strike all joints in copper and steel piping under a pressure test. Conduct tests prior to connecting to equipment or isolate equipment from system.
3. No water pressure test shall be conducted in freezing weather where subject to freezing.
4. Test shall be maintained at conditions specified until approved but, in no event, for less than eight (8) hours minimum duration, unless otherwise noted.
5. Hydrostatic pressure tests shall maintain pressure without change, except that due to temperature change.

B. Domestic Water System: Hydrostatic test; 150 PSIG

- ### C. Soil, Waste and Vent System: Static test; 10 feet minimum head. Test system in its entirety or in sections. Plug all openings except highest opening above the roof. Water shall be kept in the system, or in the portion under test, for a minimum of one (1) hour. Inspect the system, or the portion under test, after one (1) hour, the system shall be tight at all points.

PART 2 PRODUCTS

2.1 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

A. Pipe Markers

1. Manufacturers: Brimar, Seton Name Plate Co Setmark, Kolbi Industries Style A thru E(5 inch and smaller) else Style F thru H, Marking Services.
2. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

B. Install Pipe Markers on all piping systems at the following Locations:

1. Mechanical Equipment Rooms:
 - a. Within 18 inches of each valve.
 - b. Within 36 inches of each 90 elbow, tee, connection to equipment or vessel and point where pipe exits room.
 - c. At not over 20 feet intervals along all exposed piping.
2. Above Suspended Ceilings:

- a. Within 18 inches of each valve or valve assembly.
- b. At tees, identify both main and branch within 36 inches of tee.
- c. Within 36 inches of each 90 elbow.
- d. At not over 30 feet intervals along all concealed piping.

2.2 PLUMBING PIPING INSULATION

A. Glass Fiber (RIGID)

1. Manufacturers:
 - a. Johns Manville Corporation: www.jm.com.
 - b. Owens Corning Corp: www.owenscorning.com.
 - c. CertainTeed Corporation: www.certainteed.com.
2. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
 - a. 'K' value: ASTM C 177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 - b. Maximum service temperature: 650 degrees F.
 - c. Maximum moisture absorption: 0.2 percent by volume.
3. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
4. Vapor Barrier Lap Adhesive:
 - a. Compatible with insulation.
5. Insulating Cement/Mastic:
 - a. ASTM C195; hydraulic setting on mineral wool.
6. Insulating Cement:
 - a. ASTM C449/C449M.

- ### B. Piping Concealed and Exposed Above 10ft Above Finished Floor - Domestic Cold, Hot and Return piping: 1 inch thick rigid glass fiber with factory ASJ jacket.

2.3 PLUMBING PIPING

A. Soil, Waste and Vent Piping:

1. Below Slab on Grade Cast Iron Pipe: ASTM A 74, service weight below floor.
 - a. Fittings: Cast iron.

- b. Joint Seals: ASTM C 564 gaskets.
2. Above Slab on Grade Cast Iron Pipe: CISPI 301 or ASTM A888, hubless, above floor.
 - a. Fittings: Cast iron.
 - b. Joints: Shielded Couplings ASTM C 1277 Assembly: CISPI 310 and ASTM C 1540-04, with stainless steel shield, stainless steel clamp and tightening devices, and ASTM C 564 rubber sleeve.
 - 1) Manufacturers - 1½" thru 3": Medium Duty: Mission Heavyweight, Husky HD 2000; Clamp-ALL-80, Tyler Wide Body, Ideal HD.
 - 2) Manufacturers - 4" thru 10": Heavy Duty: Husky SD 4000; Clamp-ALL-120.
- B. Water Piping, Above Slab on Grade
 1. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
 - a. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - b. Fittings: ASME B16.18, ASME B16.22, wrought copper and bronze.
 - c. Joints: ASTM B32, alloy Sn95 solder.
- C. Pipe Hangers and Supports
 1. Provide hangers and supports that comply with MSS SP-58.
 2. Manufacturers: Anvil, B-Line, Grinnell, Globe or Michigan. Figure numbers are for Michigan.
 3. Plumbing Piping - Drain, Waste, and Vent:
 - a. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis. Figure 400.
 4. Plumbing Piping - Water:
 - a. Conform to ASME B31.9.
 - b. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Adjustable swivel, loop.
 - c. Copper Pipe Support: Adjustable Loop, copper plated.
 5. Pipe Hanger Spacing:
 - a. Metal Piping:
 - 1) Copper Pipe size: 1/2 inches to 1-1/4 inches:
 - (a) Maximum hanger spacing: 5 ft.

- (b) Hanger rod diameter: 3/8 inches.
- 2) Copper Pipe size: 1-1/2 inches to 4 inches:
 - (a) Maximum hanger spacing: 8 ft.
 - (b) Hanger rod diameter: 3/8 inch.
- 3) Waste/Vent Pipe size: 2 inches to 3 inches:
 - (a) Maximum hanger spacing: 8 ft.
 - (b) Hanger rod diameter: 1/2 inch.

D. Ball Valves

- 1. Up To and Including 2-1/2 Inches:
 - a. Manufacturers:
 - 1) Apollo; Model 64 Series
 - 2) Ferguson; Model 420
 - 3) Milwaukee; Model BA-475B
 - 2. MSS SP-110, NSF-61, 150 WSP, 600 psi WOG, Brass or Bronze two piece body, Full port, chrome plated brass ball, reinforced teflon seats and stuffing box ring, blow-out proof stem design, adjustable packing gland, zinc coated steel lever handle with vinyl hand grip., threaded ends.

2.4 PLUMBING SPECIALTIES

A. CLEANOUTS

- 1. Cleanouts at Interior Finished Floor Areas (FCO):
 - a. Manufacturers:
 - 1) Mifab; Model C-1100P-R
 - 2) J.R. Smith; Model 4032L
 - 3) Zurn; Model ZN1400-NL-BP
 - b. Lacquered cast iron body with anchor flange, flashing clamp and round adjustable secured Nickel Bronze top assembly with bronze plug and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

B. WATER HAMMER ARRESTORS (Install on water lines to every plumbing fixture)

- 1. Manufacturers: Unit Size: 'A' & 'B'

- a. Jay R. Smith Manufacturing Company; Model 5005.
 - b. Zurn Industries, Inc.; Model 1700-100.
2. Water Hammer Arrestors:
- a. ANSI A112.26.1M Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psi working pressure. Locate valve(s) above ceiling height of adjacent space.

2.5 PLUMBING FIXTURES

A. FLUSH VALVE WATER CLOSETS

1. FIXTURE 'WC1'; WATER CLOSET (FM, FV (1.28 gpf), ADA)
 - a. Bowl:
 - 1) Manufacturers:
 - (a) American Standard Inc.; Model 3043.001: www.americanstandard.com.
 - (b) Kohler Company; Model K-4405: www.kohlerco.com.
 - (c) Toto; Model CT705ELN: www.totousa.com.
 - (d) Sloan; Model ST-2020-A-1.28: www.sloanvalve.com.
 - (e) Zurn; Model Z-5665: www.zurn.com.
 - 2) ASME A112.19.2M; 1.28 gpf, floor mounted vitreous china closet bowl, with elongated rim, 1-1/2 inch top spud, china bolt caps; disabled access.
 - b. Fixture Accessories:
 - 1) Seat: Type 1St; See SEATS.
 - 2) Flush Valve (1.28gpf): Type 3FV; See FLUSH VALVES.

B. LAVATORIES

1. FIXTURE 'LV 1'; LAVATORY (WH, VC, ADA)
 - a. Lavatory Basin:
 - 1) Manufacturers:
 - (a) American Standard; Model 0355.012
 - (b) Kohler; Model K-2005
 - (c) Zurn; Model Z5344

- 2) ASME A112.19.2M; vitreous china, wall hung, 21" x 18" fixture with drillings on 4-inch centers, front overflow, soap depression, drilled for concealed arm carrier, disabled accessible.

b. Accessories:

- 1) Faucet: Type 3F; See FAUCETS
- 2) Drain: Type 2D; See DRAINS.
- 3) Supplies: Type SS1; See SUPPLY STOPS.
- 4) Trap: Type 1T; See TRAPS.
- 5) Carrier: See CARRIERS; Concealed Arm Type.
- 6) Insulation: See FIXTURE INSULATION.

2. FIXTURE 'LV2'; LAVATORY (CT, VC, ADA)

a. Lavatory Basin:

1) Manufacturers:

- (a) American Standard; Model 0495.300
- (b) Crane
- (c) Kohler
- (d) Toto
- (e) Zurn

- 2) ASME A112.19.2M; undercounter mounted, 17.125"x14.125" Oval, vitreous china, front overflow, disabled accessible.

b. Accessories:

- 1) Faucet: Type 3F; See FAUCETS.
- 2) Drain: Type 2D; See DRAINS.
- 3) Supplies: Type SS1; See SUPPLY STOPS.
- 4) Trap: Type 1T; See TRAPS.
- 5) Insulation: See FIXTURE INSULATION.

C. ELECTRIC WATER COOLER

1. FIXTURE 'EWC1'; ELECTRIC WATER COOLER (WH-ADA)

a. Water Cooler

- 1) Manufacturers:
 - (a) Elkay; Model EZS8 w/EWF172
 - (b) Haws; Model HWUAC8 w/6426 Filter
 - (c) Halsey-Taylor; Model HAC8FS-Q-V w/LF-1 & 15423
 - (d) Acorn; Model A111108F-WF1
- 2) ARI-1010; wall mounted electric water cooler assembly with stainless steel water surfaces, heavy duty galvanized steel wall mounting frame, 'sandstone' paint or vinyl finish cabinet, elevated anti-squirt bubblers with stream guard, automatic stream regulators; front and side push button actuators; high efficiency cooling tank and air cooled coil delivering 8.0 gph 50-degree water at 90-degree ambient air temperature; internal taste, odor, chlorine and lead filter; CFC and Lead free.

b. Accessories:

- 1) Supply: Type SS1; See SUPPLY STOPS
- 2) Trap: Type 1T; See TRAPS
- 3) Carriers: See CARRIERS

D. FIXTURE ACCESSORIES

1. Flush Valves

a. Type 3FV (Standard & ADA Electronic Water Closet Valve- Piston Type)

- 1) Manufacturers:
 - (a) Sloan; Gem 2 111-1.28-SMO-YBYC-YK
 - (b) Zurn; Model ZTS-6200EV-YB-YC-YK
 - (c) Toto; Model TET1LN32
 - (d) American Standard; Model 6065.121.002
 - (e) Kohler; Model K-10956
- 2) ASME A112.18.1; Exposed chrome plated piston or turbine type with 6VDC-4AA battery powered infrared sensor operated flush valve with heavy duty escutcheon with set screw, integral screwdriver stop, vacuum breaker; 1 1/2-inch top spud, 11 1/2-inches high; 1 solid-ring pipe support; 1.28gpf maximum flush.

2. SEATS

- a. Type 1St.; Seat (Elongated, open front, less lid, white)

- 1) Manufacturers:
 - (a) Bemis; Model 1655SSC
 - (b) Kohler; Model K-4666-S-C
 - (c) Zurn; Model Z-5955-SS-LL
 - 2) Extra heavy weight, injection molded solid plastic, open-front, less lid, molded bumpers, external check hinges and stainless steel posts.
3. FAUCETS
- a. Type 3F (Single Lever - Lavatories)
 - 1) Manufacturers:
 - (a) American Standard; Model 2385.006
 - (b) Zurn; Model Z-81000
 - 2) ASME A112.18.1M; Chrome plated brass combination supply fitting with standard chrome plated brass handles, ADA, standard spout, aerator, 0.5 gpm; less drain.
4. DRAINS
- a. Type 2D (Flat grid off-set drain - Lavatories)
 - 1) Manufacturers:
 - (a) Kohler; Model K-13885
 - (b) McGuire; Model 155-WC
 - (c) Zurn; Model Z-8746
 - 2) ASME A112.18.1M; 1 1/4" inch diameter chrome plated brass flat grid type drain with offset 17-gauge tailpiece.
5. SUPPLY STOPS
- a. Type SS1 (3/8"-inch, 1/4 turn metal to metal; Loose Key; Lavatories/Sinks)
 - 1) Manufacturers:
 - (a) Kohler; Model K-7607
 - (b) Chicago; Model 1016-CP
 - 2) ASME A112.18.1M; Chrome plated brass angle heavy duty stop with metal-to-metal seat and removable actuator key; supply tubing and escutcheon plate.
6. TRAPS

- a. Type 1T (1 1/4"-inch Adj. 'P')
 - 1) Manufacturers:
 - (a) Kohler; Model K-9000
 - (b) McGuire; Model 8872
 - (c) Zurn; Model Z-8700
 - 2) ASME A112.18.1M; Chrome plated cast brass, 17-gauge P-trap assembly with cast brass nuts, cleanout plug and heavy duty escutcheon.

7. CARRIERS

- a. Lavatories
 - 1) Type C10 'Single'
 - (a) Manufacturers:
 - (1) Josam; Model 17100-63
 - (2) JR Smith; Model 700-M31
 - (3) Zurn; Model Z-1231-D
 - (4) Mifab
 - (5) Wade
 - (6) Watts
- b. Electric Water Coolers
 - 1) Type C12 'Single'
 - (a) Manufacturers:
 - (1) Josam; Model 17900
 - (2) JR Smith; Model 830-M31
 - (3) Mifab; Model MC-30
 - (4) Wade; Model W-420-AM11
 - (5) Watts; Model CA-421
 - (6) Zurn; Model ZR-1225
- c. Carrier Notes:
 - 1) Carriers shall be manufactured in accordance with ASME A112.18.2 standards.

- 2) All carriers shall be bolted to the floor with lag bolts.

8. FIXTURE INSULATION

a. Manufacturers:

- 1) McGuire; Model 'Pro-Wrap' Series
- 2) Plumberex; Model Pro-2000 Series
- 3) Zurn; Model 'Trap Wrap' Series

- ##### b. Insulation assembly shall be for supply stops & tubing; drains (including off-sets) and P-traps under all ADA lavatories and counter sinks.

- ##### c. ANSI A117.1, ADA4.19.4; Fully molded, anti-bacterial flexible vinyl insulation assembly, minimum 1/8"-inch wall thickness, white in color, self-extinguishing meeting ASTM D635, and have a K-value of 1.17.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Each type of pipe installed shall be by the same manufacturer throughout the building.
- B. Each type of fittings installed shall be by the same manufacturer throughout the building.
- C. Install in accordance with manufacturer's instructions.
- D. Equipment and pipe support upper attachments shall be 3" x 3" x 1/4" steel angles, minimum, spanning structural members unless noted otherwise. Provide inserts and bolts for supporting pipes and equipment from structural members. Attachments shall be to top cord of bar joists. Attach to beams with beam clamps. DO NOT support from roof deck.
- E. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- F. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- G. Maintain 4 inch clearance between pipe and fittings after insulation.
- H. Group piping whenever practical at common elevations.
- I. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- J. Establish elevations of buried piping outside the building to ensure not less than 3 ft. of cover.
- K. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.
- L. Flush all debris and pipe compound from domestic water system.
- M. Install valves in a readily accessible location.

- N. Install valves with stems upright or horizontal, not inverted
- O. Pipe Hangers and Supports:
1. Support horizontal piping as scheduled.
 2. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 3. Place hangers within 12 inches of each horizontal elbow.
 4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 6. Use double nuts and lock washers on threaded rod supports.
 7. Provide copper plated hangers and supports for copper piping where hanger is in contact with tubing.
- P. Disinfection of Domestic Water Piping System:
1. Prior to starting work, verify system is complete, flushed and clean.
 2. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
 3. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
 4. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
 5. Maintain disinfectant in system for 24 hours.
 6. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
 7. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
 8. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.
- Q. Plumbing Specialty Installation:
1. Install in accordance with manufacturer's instructions.
 2. Install plumbing specialties in a readily accessible location.
 3. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

4. Encase exterior cleanouts in 6-inch concrete pad flush with grade. See detail.
5. Install 2-way cleanouts at all sanitary sewer and storm drain pipes exiting the building. Refer to detail on drawings.
6. Install floor cleanouts at elevation to accommodate finished floor.
7. Floor drains shall be set at 1/8-inch below finish floor elevation. Refer to Architectural for sloping of floor.
8. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to, all fixtures and toilet batteries. Size and install in accordance with the (Plumbing and Drainage Institute Standard) PDI WH-201.

R. Fixture Installation:

1. Install each fixture with trap, easily removable for servicing and cleaning.
2. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons, as specified in Fixture Accessories.
3. Install components level and plumb.
4. Install and secure fixtures in place with wall supports and bolts.
5. Seal wall and floor mounted fixtures to wall and floor surfaces with silicon latex tile grout. Joints shall be finished smooth and flush, not depressed. Color to match fixture.
6. Solidly attach water closets to closet flange with solid brass bolts, washers and nuts. Provide wax ring sealant on closet flange. Lead flashing shall not be used.
7. Pipe runout from urinal to waste stack shall be Brass or Schedule 40 PVC piping. Copper piping shall not be used.

S. CLEANING AND PROTECTION

1. Clean plumbing fixtures and equipment.
2. Do not permit use of fixtures.

END OF SECTION

SECTION 23 0510

GENERAL MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Definitions.
- B. Quality Assurance Requirements and Installer Qualifications.
- C. General Product Delivery and Storage.
- D. Installer Warranty.
- E. Submittal Procedures Supplementing Section 01 3000.
- F. Operating and Maintenance Manuals.
- G. Execution Requirements common to Division 23 systems.
- H. Space Conditioning during Construction.
- I. Starting equipment and Systems-General Requirements.
- J. Training Requirements.
- K. Cleaning Requirements.
- L. Finishing Requirements.

1.2 RELATED SECTIONS

- A. Section 01 3300 - Submittal Procedures, for submittal procedures.
- B. Section 01 7000 - Execution Requirements, for additional submittal and warranty requirements.
- C. Section 07 8413 - Penetration Firestopping.
- D. Section 07 9200 - Joint Sealants.
- E. Section 09900 - Painting and Coatings.

1.3 DEFINITIONS

- A. Manufacturer's Representatives: Wherever MANUFACTURER'S REPRESENTATIVE is referred to in this division, said representative shall be regularly employed by the manufacturer to perform similar activities to those called for herein, which indicates his competence in that field of work.

- B. Concealed: Where the word concealed is used in this Division, it shall mean items above ceilings, in attics, in crawl spaces, in chases, in tunnels, in cabinet work, and under counters or equipment so as to be not visible from an elevation of 5 feet at a horizontal distance of 10 feet.
- C. Finished Spaces or Areas: Where finished spaces or areas are referred to in this Division, it shall mean all spaces except concealed spaces, mechanical rooms, or boiler rooms unless otherwise noted.
- D. Provide: Furnish and install.
- E. Control and Interlock Wiring: All wiring, both line voltage and low voltage, other than power wiring from an electrical distribution panel, through the primary control device, to the item of equipment.
- F. Primary Control Device: That ONE device for any item of equipment which interrupts power flow during normal operation. Where magnetic starters are provided, they are the primary control. For items not switches by starters, the primary control device will be that ONE thermostat, time clock, manual switch, aquastat, P.E. switch, or relay performing the primary switching.
- G. Diagrammatic: A drawing that shows arrangement and relations (as of parts).i.e.: A diagrammatic drawing uses symbols rather than pictorial representation of pipes, ducts, conduit and other items shown and is not necessarily to scale. Arrangement, location, and sizes shown are firm.
- H. Readily Accessible: Items requiring maintenance shall be available for close approach for maintenance or use in a space, through an access door from floor elevation, or above a lay-in ceiling though an access point by maintenance staff safely standing on a ladder no taller than the ceiling.
- I. Noted, Indicated or Shown: Where the terms "Noted", "Indicated" or "Shown" are used in these specifications, the words "in the specifications or on the plans" shall be inferred.
- J. Detail: Where reference is made to a Detail, the Detail shall be on the plans unless otherwise noted.
- K. Specifications: Where reference is made to these specifications, it shall be inferred in this Division of specifications.
- L. Notification by the Contractor, and Instructions to the Contractor: Where reference is made in these specifications to notification by or instructions given to the Contractor, it shall be inferred that the Design Professional shall be the instructor or shall be notified, as the case exists.
- M. Division or Section Reference: Where reference is made to another Division or Section within this Division, refer to specifications table of contents for Division, Section, or Page Number.
- N. Flow Diagram: A single-line, two-dimension, non-scaled drawing depicting arrangement and sequence of equipment, valves, controls, thermometers, gauges, and other specialty devices in a pipe or duct system.

1.4 REGULATORY REQUIREMENTS

- A. Where requirements of these specifications exceed specified codes and ordinances, conform to these specifications.
- B. Materials and equipment included in Underwriters Label Service shall bear that label. Electrical equipment shall be U.L. approved as installed.
- C. Permits and Codes: Refer to the General Conditions.
- D. Fire Prevention Precautions in Cutting and Welding Areas: Conform to Article 2605 Fire Prevention Precautions, Georgia State Minimum Standard Fire Prevention Code (International Fire Code), 2012 Edition, with all Georgia State Amendments, for all work involving cutting and welding.
- E. HVAC: Conform to the Georgia State Minimum Standard Mechanical Code, International Mechanical Code, 2012 Edition with all Georgia State Amendments.
- F. Energy: Conform to the Georgia State Energy Code for Buildings, International Energy Conservation Code, 2009 Edition, with all Georgia State Amendments.
- G. All Work: Conform to State of Georgia Chapter 120-3-3 "Rules of Safety Fire Commissioner, Rules and Regulations, January 30, 2014", and ADA.
- H. Electrical: Refer to Division 26. Conform to the National Electrical Code, NFPA 70, 2014 Edition.
- I. Building Code: Conform to the Georgia State Minimum Standard Building Code, International Building Code, 2012 Edition with all Georgia State Amendments.

1.5 SUBMITTALS

- A. Supplementing Division 1 Administrative Requirements; the Contractor shall:
 - 1. Identify all submittals by a cover sheet showing project name, specification section, drawing or detail number, room number, date, revision date, contractor and subcontractor's organization and project manager with phone number, the model, style and size of item being submitted with manufacturers' representative, salesman (or a preparer who can answer questions), and Preparer's phone number.
 - 2. Prepare a master list of submittal proposed to be submitted on the project. This list shall be updated for each submission and shall be the first sheet(s) of the submission in the quantity that is submitted for review. The information and general format of the master list shall contain a Specification Section, Section Title, Item Description, Item Status and any comment.
 - 3. Review the submittal data and check to ensure compliance with specifications prior to submitting.
 - a. The Contractor agrees that submittals of equipment and material and shop drawings of equipment and material layouts required under provisions of these specifications and processed by the Design Professional are not Change Orders. The purpose of submittals is to demonstrate that the Contractor understands the design concept of

the project by indicating the equipment and materials he intends to furnish and install, and by detailing the installation he intends to achieve.

- b. The Contractor shall conform to the requirements of the Contract Documents unless a change order is issued. The Contractor shall identify on each submittal that the submittal contains no deviations or the Contractor shall identify any proposed deviations.
 - c. Any submittal or shop drawing not conforming to the Contract Documents without this identification and notification shall be assumed to be marked "Revise and Resubmit" (the contractor acknowledges this by the submission), and the Contractor shall promptly resubmit said submittal so as to be in full compliance with the Contract Documents.
 - d. Failure of the Contractor to provide this information during the shop drawing phase shall make the Contractor responsible for all changes to achieve compliance with the Contract Documents without additional compensation.
4. Provide a Letter from the HVAC Contractor stating that they have checked all submittals for compliance with specifications.
5. Product Data:
- a. Provide data specific to the product proposed indicating capacity data, all standard and optional features to be supplied and all accessories and options available for that product.
 - b. Manufacturers' standard drawings shall be modified by deletions or additions to show only items applicable to this project.
- B. Deliver submittals to the Design Professional at the business address.
- C. Digital Delivery of Submittals:
1. Submittal data may be posted to the NBP Engineers FTP site when agreed upon by the Design Professional and the Owner during the preconstruction phase. The Contractor will be provided with a project folder and a password.
 2. Prepare the submittals as described above. Take steps to reduce submittal file size.
 3. Do not scan in color or high resolution unless required for clarity.
 4. Optimize any scans to help control file size.
 5. Ensure any reproductions are legible.
 6. Organize Submittal files individually by specification section with file name format as Follows; "*CS/Section# - Section Title - any further identifier required such as control drawings*"
 7. Send an email to submittal@nbpengineers.com with a copy to the HVAC Design Professional and any Architectural Design Professional identified during the preconstruction phase.

8. Identify the submittal using the official project title, specification section and submitted item. i.e. Project No. G-xxx, Addition to Administrative Building-Section 230548-Vibration and Seismic Controls. Include drawing or detail number, room number, date, revision date(s), contractor and subcontractor's organization as applicable
 9. Include the project manager's and manufacturers' representatives, salesman's (or a preparer who can answer questions) contact information, email and phone number.
 10. Identify the submittal in the email subject line using the same information listed above.
 11. Provide a submittal index.
 12. Ensure any submittal posted to NBP's or other FTP site has the same identification.
 13. NBP Design Professionals will not process or react to submittals which are not properly transmitted, indexed, and identified.
- D. Tabulation of Power Wiring Requirements: Within 60 Days of the Notice to Proceed, provide a Tabulation of Power Wiring Requirements of all proposed equipment, including H.P., amps, voltage, phase and KW, tabulated on a separate sheet. A copy of the tabulation shall be transmitted independently to the Contractor, the Design Professional and to all affected trades. (Refer to Electrical Drawings for electrical provisions for equipment.)
- E. Warranty: Submit the HVAC installer's warranty letter addressed to the Owner stating the correct project name and number, if applicable, the warranty period and ensure that form has the correct date of the Material Completion.

1.6 OPERATING AND MAINTENANCE MANUALS

- A. Operating and Maintenance Manuals shall be prepared by the Contractor for all equipment and be submitted for review a minimum of prior to the request for Material Completion.
- B. Digital delivery of Operating and Maintenance Manuals:
1. Operating and Maintenance Manuals may be delivered digitally and posted to the NBP Engineers FTP site when agreed upon by the Design Professional and the Owner during the preconstruction phase. The Contractor will be provided with a project folder and password.
 2. Prepare the Operating and Maintenance Manuals as described above. Take steps to reduce submittal file size.
 3. Do not scan in color or high resolution unless required for clarity.
 4. Ensure any reproductions are legible.
 5. Send an email to submittal@nbpengineers.com with a copy to the HVAC Design Professional and the Architectural Design Professional identified during the preconstruction phase.
 6. Identify the manuals in the email subject line using the official project title, specification section and submitted item. I.E. Project No. G-xxx, Addition to Administrative Building.

7. Table of Contents(Index) sheets shall be included in the order listed with identifications typed in capital letters.
 8. Ensure the manuals posted to the FTP site has the same identification.
 9. NBP Design Professionals will not process or react to manuals which are not properly transmitted, indexed, and identified.
- C. Each Manual shall contain the following information, data and drawings:
1. Copies of submittals (with Design Professional's review comments and stamp), equipment and materials.
 2. Manufacturer's installation, operating and maintenance instructions for each item of equipment with moving parts including recommended frequency of inspections and maintenance for one year of facility operation.
 3. Manufacturer's list of renewal parts for each item of equipment with recommended stock items and quantities indicated.
 4. Control diagrams, electrical interlock diagrams, and control valve lists.
 5. Copies of as-built shop drawings showing layouts and construction details.
 6. Copies of Test and Balance Reports including list of instruments and description of methods employed.

1.7 QUALITY ASSURANCE

A. HVAC Installer Qualifications:

1. Wherever the word "company" or "firm" is used in these subparagraphs, it shall mean the contractor/subcontractor of record for the installations used for proficiency qualification.
2. Refer to the individual sections within this division for additional installer qualification requirements.
3. The Contractor expressly warrants that the company performing the installation of the air conditioning systems has demonstrated proficiency in the installation, start-up and adjustment of such systems by the successful performance of work of the nature specified herein on at least three commercial or institutional buildings, each containing minimum of 200 tons capacity or greater with ducted air distribution and chilled water, PTAC or wall hung units excluded.
4. The Contractor further warrants that the aforesaid subcontractor, if any, has trained personnel, instruments, tools, and equipment to perform the installation, start-up, instruction and maintenance service specified.
5. The Contractor also warrants that the aforesaid installer, if any, has been in business performing services of the nature specified herein for at least five years.

B. Testing and Balancing Qualifications: Refer to Section 23 0593.

1.8 WARRANTY

- A. Refer to Section 01 7000 - Contract Closeout, for additional warranty requirements.
- B. Submit manufacturers' warranties prior to final inspection. Refer to the General Conditions.
- C. Correct any defective Work within a one year period after Date of Material Completion. Provide HVAC Installer's warranty letter dated the date of the Material Completion
- D. Where warranties beyond the Contractor's one (1) year warranty are specified, the additional warranty time shall start on the same date as the Contractor's warranty.

PART 2 PRODUCTS -NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

- A. Refer to the specifications and Architectural and Structural drawings for additional requirements pertaining to work under this discipline. Notify the Design Professional for clarification in the event of conflict.
- B. All materials of systems installation exposed in hollow spaces that are used as ducts or plenums shall have a flame spread rating of 25 or less and a smoke development rating of 50 or less.

3.2 PREPARATION

- A. Drawings are diagrammatic and show the general proximity of the equipment, ducts, and pipes, etc., are not to be scaled, and do not include all required changes in direction or offsets necessary in coordinating the installation of various materials either between trades or within the same trade. All dimensions shall be verified at the building site. Prefabrication and/or installation of work from drawings shall be at the Contractor's risk. Refer to Architectural plans for exact building dimensions and details.
- B. Space Conditions:
 - 1. All apparatus shall fit into the available spaces in the building and must be introduced into the building so as not to cause damage to the structure. Equipment larger than access to equipment spaces shall be disassembled into sub-assemblies for installation.
 - 2. Where deviations from the plans are required in order to conform to the space limitations, such changes shall be made at no additional cost to the Owner and shall be subject to approval.
 - 3. All equipment requiring service shall be made accessible. Coordinate piping and ductwork installation to avoid conflict with other trades.

3.3 INSTALLATION

- A. Clearance above and in front of electrical switchgear, electrical power panels or control panels shall be maintained by mechanical systems so that no mechanical ducts, pipes, vents or

equipment is routed above or across the space directly above this equipment in conformance with the National Electrical Code.

- B. All equipment shall be installed in accordance with manufacturers' published installation instructions shipped with the equipment. In the event there is a discrepancy between these specifications or Drawings and the manufacturers' instructions, no work shall be performed until additional instructions are received.
- C. Install and connect all appliances, equipment, and appurtenances as specified, indicated or required in accordance with the manufacturer's instructions and recommendations. Furnish and install complete auxiliary piping, water seals, valves, electric connections, and similar items, recommended by the manufacturer or as required for proper operation.
- D. Equipment, valves and other items installed under this division requiring service shall be installed to be readily accessible. Refer to definitions in this section.
- E. Coordinate with the Contractor and monitor the progress of the work so that other trades do not obstruct items requiring access for service.
- F. After final balancing, equipment with belt drives shall have their belts operating in the mid-80% position of the adjustable sheave.
- G. Provide equipment belt and coupling guards shielding the perimeter and face of all new belt drives, shafts and couplings. Provide openings opposite drive and driven shafts to permit use of revolution counter. Guards for fans shall be supported from the fan and mounting base, independent of the floor or housekeeping pad.
- H. Route piping and ductwork to avoid skylights, translucent, and transparent ceilings.
- I. Seal sleeves and openings in exterior walls vaportight or watertight as applicable.
- J. Equipment and pipe support upper attachments shall be 3" x 3" x 1/4" steel angles, minimum, spanning structural members unless noted otherwise. Provide inserts and bolts for supporting pipes and equipment from structural members.
- K. Saw cut or core drill openings in existing work for the installation of the mechanical system. Patching shall be performed by the trade whose work is cut. Contractor shall lay out and install his work ahead of the work of other trades wherever possible.

3.4 SPACE CONDITIONING DURING CONSTRUCTION

- A. Coordinate with the Contractor regarding the limits of space conditions specified or requested by other trade sections.
- B. Assist the Contractor in the preparation of the construction schedule and determine to what extent the project's HVAC system can be operated within the restrictions listed below to help maintain those conditions.
- C. Ducted air handling systems shall not be placed into operation for testing or for temporary space conditioning until all walls in areas served by the system have been prepared for painting and the building is broom clean.

- D. The building's HVAC system shall be kept clean during the entire construction process. Protect equipment, motor, ducts, pipes from dirt and debris.
- E. Filters during construction:
 - 1. Provide and maintain filters on all air handling equipment and terminal units used for space conditioning during construction.
 - 2. Provide and maintain filters on all return air grilles once ceilings are installed when air handling equipment or terminal units are used for space conditioning during construction.
 - 3. Provide filters with a minimum MERV rating of 8.
- F. Heating Terminal units such as unit heaters, cabinet heaters and finned radiation may be used for temporary heat during construction. Clean to new condition.

3.5 STARTING EQUIPMENT AND SYSTEMS

- A. Adjust equipment for proper operation within manufacturers' published tolerances.
- B. Demonstrate proper operation of systems and equipment to the Owner 's designated representative.

3.6 DEMONSTRATION, TRAINING AND INSTRUCTIONS

- A. A manufacturer's service representative shall provide the instructions for each piece of equipment on system when specified in other Sections of this Division. A manufacturer's sales representative is not acceptable. (The instructor shall not be a sales person, but shall have service experience on a continuing basis and be knowledgeable about the subject equipment.)

3.7 CLEANING AND PROTECTION

- A. All materials, equipment and mechanical rooms shall be cleaned prior to Material Completion.
- B. Wash down and scrub clean all mechanical room floors, walls, equipment bases and equipment.
- C. Paint equipment where finish has been damaged requiring retouching of finish to match factory finish.
- D. All air handling equipment shall be cleaned internally prior to Material Completion. Clean unit casing externally and internally. Seal/replace all damaged duct liner.
- E. Chipped or scraped paint shall be retouched to match original finish.
- F. Clean and polish all equipment nameplates. All nameplate information shall be legible.
- G. All dents and sags in ductwork and equipment casings shall be straightened.
- H. All ductwork, insulation, equipment, pipe, pipe fittings and appurtenances shall be free of dust, rust and stains prior to Material Completion.

3.8 FINISHING EQUIPMENT AND MATERIAL

- A. Use paint systems specified in Division 9 for the substrates to be finished.
- B. Paint shop-primed equipment.
- C. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- D. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.
- E. All ferrous fasteners and hanger supports not having a corrosion resistant plated finish shall be painted to prevent rust.
- F. Paint all exposed un-insulated ferrous metals, flat black.
- G. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
- H. Concrete Equipment pads: Clean concrete and paint pad safety yellow.

END OF SECTION

SECTION 23 0513

MOTORS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Single phase electric motors.

1.2 RELATED REQUIREMENTS

- A. Section 26 2717 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

- A. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2014.
- B. NFPA 70 - National Electrical Code, 2014 Edition; National Fire Protection Association.

1.4 QUALITY ASSURANCE

- A. Conform to NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Baldor, Century, Lincoln, Marathon, Magnetec, Toshiba

2.2 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Electrical Service:

1. Motors 1/2 HP and Smaller: 115 volts, single phase, 60 Hz.
2. Refer to Electrical drawings for voltage and phase required.

- B. Overload Protection: Single phase motors shall be furnished with built-in automatic reset overload protection.

- C. Brake Horsepower: All motors shall have rated horsepower at least 10 percent above the indicated brake horsepower of equipment including belt losses and inlet vane losses.

D. Construction:

1. Open drip-proof type except where specifically noted otherwise.

2. Design for continuous operation in 40 degrees C environment.
 3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
 4. All copper windings and leads.
 5. Motors for belt driven equipment and base mounted pumps shall have cast iron yoke and bearing housings.
- E. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.
- F. Wiring Terminations:
1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
 2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.3 APPLICATIONS

- A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not conform to these specifications.
- B. Single phase motors for shaft mounted fans or blowers: Permanent split capacitor type.
- C. Single phase motors for fans: Capacitor start, capacitor run type.

2.4 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

- A. Starting Torque: Exceeding one fourth of full load torque.
- B. Starting Current: Up to six times full load current.
- C. Multiple Speed: Through tapped windings.
- D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

2.5 SINGLE PHASE POWER - CAPACITOR START MOTORS

- A. Starting Torque: Three times full load torque.
- B. Starting Current: Less than five times full load current.
- C. Pull-up Torque: Up to 350 percent of full load torque.
- D. Breakdown Torque: Approximately 250 percent of full load torque.

- E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.
- F. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve bearings.
- G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION

SECTION 23 0548

VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Vibration isolators.

1.2 REFERENCE STANDARDS

- A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2011.

1.3 SUBMITTALS

- A. Refer to Section 23 0510 - General HVAC Requirements, for submittal procedures.

- B. Product Data:

- 1. Provide manufacturer's product literature documenting compliance with PART 2 PRODUCTS.

- C. Shop Drawings:

- 1. Provide schedule of vibration isolator type with location and load on each.

- D. Manufacturer's Instructions: Indicate installation instructions with special procedures and setting dimensions.

1.4 QUALITY ASSURANCE

- A. Perform design and installation in accordance with applicable codes.

- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Amber Booth: www.amberbooth.com.

- B. Isolation Technology, Inc.: www.isolationtech.com

- C. Kinetics Noise Control, Inc.: www.kineticsnoise.com.

- D. Korfund Dynamics: www.thevmcgroup.com.

- E. Mason Industries: www.mason-ind.com.

- F. Vibration Eliminator Company, Inc.; _____: www.veco-nyc.com.

G. Vibration Mounting and Control: www.vmc-kdc.com.

H. Vibro-Acoustics: <http://www.vibro-acoustics.com>.

2.2 PERFORMANCE REQUIREMENTS

A. General:

1. All vibration isolators, base frames and inertia bases to conform to all uniform deflection and stability requirements under all operating loads.
2. Steel springs to function without undue stress or overloading.

2.3 VIBRATION ISOLATORS

A. Non-Seismic Type:

1. Neoprene Rubber Mount or Hanger: Molded rubber designed for 0.4 inch deflection with threaded insert.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

- A. Install in accordance with manufacturer's instructions.
- B. Vibration isolation hangers shall be positioned as close as possible to the structure without coming in contact with any object (including the structure).
 1. Hanger rods shall not contact any object which would short circuit the isolator.

3.2 SCHEDULE

A. Equipment Isolation Schedule.

1. Suspended fans:
 - a. Isolator Type: Rubber Mount or Hanger.
 - b. Isolator Deflection: .75 inches.

END OF SECTION

SECTION 23 0553

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nameplates.

PART 2 PRODUCTS

2.1 NAMEPLATES

- A. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.
- B. Size: 1/2 inch high letters unless otherwise noted.
- C. Size when located on ceiling grid: 3/8 inch high letters unless otherwise noted.

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

- A. Identify wall hung heat pump units, PTAC units, fans, and electric heaters with plastic nameplates.

END OF SECTION

SECTION 23 0593

TESTING, ADJUSTING AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Initial testing, adjustment, and balancing of air systems.
- B. Measurement of final operating condition of HVAC systems.
- C. Testing of control sensors, controllers and safeties.

1.2 REFERENCE STANDARDS

- A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council; 2002.
- B. NEBB (TAB) - Procedural Standard for Testing Adjusting and Balancing of Environmental Systems; National Environmental Balancing Bureau; 2005, Seventh Edition.

1.3 SUBMITTALS

- A. Refer to Section 23 0510 - General HVAC Requirements for submittal procedures.
- B. Submit name of adjusting and balancing agency for approval within 30 days after Notice to Proceed.
- C. Initial Review: Submit results of testing and balancing agency's examination of documents and systems within 30 days after Notice to Proceed.
- D. Initial Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - 1. Submit under provisions of Section 01 4000.
 - 2. Submit prior to the Contractor's Request for Material Completion.
 - 3. Submit copies of report for review prior to final acceptance of Project. Provide final copies for the Design Professional and for inclusion in operating and maintenance manuals.
 - 4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 6. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
 - 7. Test Reports: Indicate data on AABC MN-1 forms, forms prepared following ASHRAE Std 111, or NEBB forms.

8. Include the following on the title page of each report:
 - a. Name of Testing, Adjusting, and Balancing Agency.
 - b. Address of Testing, Adjusting, and Balancing Agency.
 - c. Telephone number of Testing, Adjusting, and Balancing Agency.
 - d. Project name.
 - e. Project location.
 - f. Project the Design Professional.
 - g. Project Engineer.
 - h. Project the Contractor.
 - i. Report date.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 1. AABC MN-1, AABC National Standards for Total System Balance.
 2. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work and submit Report prior to the Final Observation of the project.
- C. TAB Agency Qualifications:
 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 2. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabchq.com; upon completion submit AABC National Performance Guaranty.
 - b. NEBB, National Environmental Balancing Bureau: www.nebb.org.
 3. Company shall an independent firm with no relationship with any Contractor on this Project.
- D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

- E. Pre-Qualified TAB Agencies: Testing and Balancing shall be performed by one of the following firms:
1. Air Analysis of Atlanta.
 2. Air Data - Macon, Inc.
 3. Alpha Air Balance.
 4. Atlanta Air Balance.
 5. HVAC Testing Services, Inc.
 6. TAB Services.
 7. Thomas Balancing.

3.2 EXAMINATION

- A. Review the contract documents and existing conditions for appurtenances and arrangement for balancing prior to the installation of any equipment or material. the Contractor shall notify the Design Professional of any omissions noted within 30 days of the Contractor's notice to proceed.
- B. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
1. Systems are started and operating in a safe and normal condition.
 2. Temperature control systems are installed complete and operable.
 3. Proper thermal overload protection is in place for electrical equipment.
 4. All filters are clean and in place. If required, install temporary media in addition to filters.
 5. Duct systems are clean of debris.
 6. Fans are rotating correctly.
 7. Fire and volume dampers are in place, accessible, operable and open. Report observation on test report.
 8. Smoke dampers are in place, damper and operator are accessible, damper is operable, and open. Report observation on test report.
 9. All dampers and operators function smoothly from shut-off to full open.
 10. Air coil fins are cleaned and combed.
 11. Access doors are installed at specified components are accessible, are closed and duct end caps are in place.
 12. Air outlets are installed and connected.

13. Duct system leakage is minimized.

3.3 PREPARATION

- A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to the Design Professional to facilitate spot checks during testing.
- B. Testing of equipment shall be simultaneous where components of a systems are connected; e.g. DX coil and condensing unit.

3.4 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 5 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
- C. Building Pressure: Ensure that installation tolerances result in each floor of the building being positively pressurized with respect to outside ambient pressure.

3.5 RECORDING AND ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.6 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct. Close openings after measurement with permanent manufactured plugs.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to the extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

- F. Vary total system air quantities by adjustment of fan speeds by drive sheave adjustment. Provide drive changes required to place belt in mid-position at final RPM. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including pressure drops at all components including filters and fans, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions. Adjust operators on outside air dampers to ensure tight seal when shut.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. The differential at the time of balance between the outside and return air streams shall be 15 degrees F, minimum, when the outside air quantities are established by temperature differential.
- L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain positive building pressure near the building entries under all operational sequences.

3.7 CONTROL SYSTEM PROCEDURE

- A. Sequence of Operation: Operate systems thru specified Sequence and confirm system function.
- B. Thermostats, Input/Output sensors and Controls: Measure temperature or flow at device and record measurement and setting of controller.

3.8 SCOPE

- A. Test, adjust, and balance the following:
 - 1. Packaged Terminal Air Conditioning Units
 - 2. Packaged Wall Mounted Heat Pump Units.
 - 3. Terminal Heat Transfer Units
 - 4. Fans, Powered Ventilators and Exhausters
 - 5. Laboratory Airflow Control Systems
 - 6. Air Inlets and Outlets

3.9 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:

1. Manufacturer
2. Model/Frame
3. HP/BHP
4. Phase, voltage, amperage; nameplate, actual, no load
5. RPM
6. Service factor
7. Starter size, rating, heater elements
8. Sheave Make/Size/Bore

B. V-Belt Drives:

1. Identification/location
2. Required driven RPM
3. Driven sheave, diameter and RPM
4. Belt, size and quantity
5. Motor sheave diameter and RPM
6. Center to center distance, maximum, minimum, and actual

C. Cooling Coils:

1. Identification/number
2. Location
3. Service
4. Manufacturer
5. Air flow, design and actual
6. Entering air DB temperature, design and actual
7. Entering air WB temperature, design and actual
8. Leaving air DB temperature, design and actual
9. Leaving air WB temperature, design and actual
10. Saturated suction temperature, design and actual
11. Air pressure drop, design and actual

D. Air Moving Equipment:

1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Arrangement/Class/Discharge
6. Air flow, specified and actual
7. Return air flow, specified and actual
8. Outside air flow, specified and actual
9. Total static pressure (total external), specified and actual
10. Inlet pressure
11. Discharge pressure
12. Sheave Make/Size/Bore
13. Number of Belts/Make/Size
14. Fan RPM
15. Describe filter condition.
16. Plot actual fan operating point on fan curve chart.

E. Exhaust Fans:

1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Air flow, specified and actual
6. Total static pressure (total external), specified and actual
7. Inlet pressure
8. Discharge pressure
9. Sheave Make/Size/Bore

10. Number of Belts/Make/Size
11. Fan RPM
12. Plot actual operating point on pump curve chart.

F. Duct Traverses:

1. System zone/branch
2. Duct size
3. Area
4. Design velocity
5. Design air flow
6. Test velocity
7. Test air flow
8. Duct static pressure
9. Air temperature
10. Air correction factor

G. Air Distribution Tests:

1. Air terminal number
2. Room number/location
3. Terminal type
4. Terminal size
5. Area factor
6. Design velocity
7. Design air flow
8. Test (final) velocity
9. Test (final) air flow
10. Percent of design air flow
11. Relative position of balancing damper

H. Space Temperature and Humidity:

1. Temperature and humidity (whether controlled or not) of each conditioned space
2. Setpoint of each controlling thermostat or humidity sensing device.

END OF SECTION

SECTION 23 0713
DUCT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

1.2 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- B. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association 2007.

1.3 SUBMITTALS

- A. Refer to Section 23 0510 - General HVAC Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.
 - 1. CertainTeed Corporation: www.certainteed.com.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that ducts have been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Provide insulation with vapor barrier jackets.
- D. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
- E. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, duct lined with duct liner, heating coil return bends at terminal units, and expansion joints.
- F. Fiber Glass, Flexible:
 - 1. Do not pull insulation tight around ducts.
 - 2. Lap transverse joints 2 inch, minimum and secure with staples 18 inches on center.
 - 3. Wrap insulation with Tie Wire 18 inches on center, maximum.
 - 4. Install mechanical fasteners not more than 18 inches on center on ducts over 24 inches wide.
 - 5. Provide 24 inch length, minimum, of rigid glass fiber insulation on bottom of ducts supported from trapeze hangers.
- G. Weld mechanical fasteners to duct. No glue or stick on allowed.
- H. Duct Accessories, Duct Mounted Meters and Gages Instruments and Duct Mounted Instrumentation and Other Control Devices:
 - 1. In conditioned spaces devices shall be left exposed and/or accessible above the insulation vapor barrier jacket for access. Seal to vapor barrier jacket.
 - 2. In non-conditioned spaces devices shall be insulated within the insulation vapor barrier jacket with the insulation and jacket arranged to provide access.
 - 3. Accessible devices to include:
 - a. Duct mounted Instrumentation,
 - b. Airflow Measuring Station pressure ports,
 - c. Input/Output Sensors,

- d. Duct access door handles,
 - e. Volume Control damper handles(MVD),
4. Damper operators shall be left exposed and/or accessible above the insulation vapor barrier jacket for access. Seal to vapor barrier jacket.

3.3 CLEANING

- A. Clean adjacent surfaces, valves, valve handles, etc. of jacketing materials.

3.4 SCHEDULES

- A. Exhaust Ducts Within 10 ft. of Exterior Openings/Termination:
 - 1. Glass Fiber, Flexible; 2 inch thick.

END OF SECTION

SECTION 23 0994

HVAC SEQUENCE OF OPERATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sequence of operation for:

1. Fan Interlocks.

1.2 RELATED SECTIONS

A. Section 23 0923 - Digital Control Equipment.

1.3 SYSTEM DESCRIPTION

A. This Section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other Sections.

1.4 SUBMITTALS

A. Refer to Section 23 0510 - General HVAC Requirements for submittal procedures.

B. Shop Drawings: Indicate mechanical system controlled and control system components.

1. Label with settings, adjustable range of control and limits.
2. Include written description of control sequence.
3. Include flow diagrams for each control system, graphically depicting control logic.

C. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL

A. All operators shall be in NORMAL position when each system is OFF.

B. Provide smoke detector in supply air stream on all air systems over 2000 CFM. Refer to NFPA 90A, 2002.

C. All temperatures are Fahrenheit.

3.2 MISCELLANEOUS FAN SEQUENCES

- A. Exhaust Fans EF-1, EF-2, EF-3: Interlock to operate with toilet room lights.

END OF SECTION

SECTION 23 3100

HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal ductwork.
- B. Flexible Ducts.
- C. Ductwork Fabrication.

1.2 RELATED REQUIREMENTS

- A. Section 23 0713 - DUCT INSULATION: External insulation and duct liner.
- B. Section 23 3300 - AIR DUCT ACCESSORIES.

1.3 REFERENCE STANDARDS

- A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 2013.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.
- E. SMACNA - Duct Cleanliness for New Construction Guidelines., 2000.
- F. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 DEFINITIONS

- A. Low Pressure Duct: Duct having Pressure Class of 2-inches or less.
- B. Medium or High pressure Duct: Duct having Pressure Class over 2-inches.

1.5 SUBMITTALS

- A. Refer to Section 23 0510 - General HVAC Requirements for submittal procedures.
- B. Product Data: Provide data for:
 - 1. Duct take-off fittings.
 - 2. Manufactured metal ductwork and fittings.

3. Flexible ducts.
4. Transverse Duct Connection System.

1.6 QUALITY ASSURANCE

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

1.7 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

1.8 DELIVERY, STORAGE, AND PROTECTION(REFER TO DUCT CLEANLINESS LEVEL SPECIFIED IN INSTALLATION)

- A. Store in clean dry place and protect from weather and construction traffic.
- B. Exercise care during construction to prevent the accumulation of dust, dirt, and refuse in the supply and return ductwork.
- C. All openings shall be tightly closed with 8-mil polyethylene when work creating dust and debris is in progress.
- D. Exposed Spiral Duct in finished spaces:
 1. Accept products on site in protective wrapping. Inspect for damage.
 2. Protect surface and finish from damaged(dings), grease or other contaminants affecting duct finish.
 3. "Nested" shipment for exposed duct shall not be acceptable.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.
- B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 2. VOC Content: Not more than 250 g/L, excluding water.
 3. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.

4. Manufacturers:

- a. Manufacturers (water based): Ductmate Proseal, Hardcast IronGrip 601, Marathon 460, Foster 32-19; Childers CP-146, DuroDyne SAS.

2.2 DUCTWORK FABRICATION

A. General:

1. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE Handbook - Fundamentals.
- C. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- D. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
- E. All dimensions are net inside metal measurements in inches unless otherwise shown.
- F. Duct sizes shown include allowance for liner thickness unless otherwise noted, except sizes shown for lined round spiral and flat oval duct are sizes of perforated inner liner
- G. Exposed Duct:
1. Exposed duct in finished spaces shall be medium pressure Spiral duct and fittings.
 2. Exposed duct finish shall be mill phosphatized for field painting.
 3. Provide segmented standing seam elbows on exposed duct in finished spaces.
- H. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips.
- I. Low Pressure Duct- Exhaust (2" Class or less):
1. Longitudinal Seams:
 - a. Corner Seams: Fig. 2-2, Type L1 (Pittsburgh Lock).
 - 1) Corner seams for ducts less than 18 inch, L-2 (Button Punch Snap Lock) is acceptable.
 - b. Fig. 2-2, Type L-3 for seams other than corner.
 2. Transitions:
 - a. Changes in duct sizes shall be made by transitions.
 - b. Refer to Fig. 4-7, CONCENTRIC TRANSITION, unless otherwise noted.

- c. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
 - d. Transitions shall be provided between equipment and duct where sizes are not the same.
3. Rectangular Duct:
- a. Elbows:
 - 1) Mitered with turning vanes. Type RE 2, Figure 4-2, unless otherwise noted.
 - b. Turning Vanes:
 - 1) Turning vanes shall be in accordance with Figs 4-3 and 4-4, unless otherwise noted.
 - 2) Provide single wall vanes for ducts 18" width or less.
 - 3) Provide double wall vanes for ducts over 18" width.
 - c. Splits and Tees:
 - 1) Fig. 4-5, Type 1, Type 2 (with stationary splitter), 4A, or 4B only.
 - 2) Use of Square Throat Elbow with Turning Vanes is acceptable, unless otherwise noted.
 - (a) Provide volume control damper in each branch.
 - 3) Omit volume control damper in Return and Exhaust duct unless otherwise noted.
 - d. Where acoustical lining is indicated, provide acoustical turning vanes of perforated metal with glass fiber insulation.
4. Round Duct - Manufactured Spiral Duct:
- a. Elbows: Radius elbow with radius not less than 1-1/2 times width of duct on centerline.
5. Branch and Runout Connections:
- a. Entry fittings for Return and Exhaust: Construct for a 45 degree entry angle to ease the turbulence created by converging airstreams. Increase the minimum length shown in Fig. 4-6, 45 DEGREE ENTRY, from 4 inch to 6 inch.
 - b. Rectangular Branch or Runout from Rectangular Duct:
 - 1) Fig. 4-6, 45 DEGREE ENTRY, with flange and gasket for connection to trunk with a minimum of six screws.

- c. Round Branch or Runout from Rectangular Duct:
 - 1) Fig. 4-6, 45 DEGREE LEAD IN, with flange and gasket for connection to trunk with a minimum of six screws.
 - 2) Provide volume control damper with locking quadrant at branch or runout connection.
- d. Round Branch or Runout from Round Duct:
 - 1) Fig. 3-5, 90 DEGREE tee fitting with 45 DEGREE oval to round tap, unless otherwise noted.
 - 2) Fig. 3-6, CONICAL TEE fitting.
- e. Rectangular Runout to Sidewall Grille/Register:
 - 1) Fig. 4-6, 45 DEGREE ENTRY, with flange and gasket for connection to trunk with a minimum of six screws.
- 6. Offsets: Fig. 4-7, Type 1 and Type 3 only, unless otherwise indicated.
- 7. Dampers: Fig. 7-4, SINGLE BLADE TYPE, or 7-5, MULTIBLADE TYPE.
- 8. Reinforcement:
 - a. Fabricate ducts in clearance critical areas such as chases and above ceilings to unreinforced standards, Fig. 2-8.
 - 1) Tie Rod Reinforcement is acceptable in Supply, Return, and Exhaust duct only.
 - 2) No screw or rivets are allowed to penetrate ducts.
- J. Ducts Connecting to Wall Louvers:
 - 1. Provide sheet metal plenum sealing louver area and connecting duct.
 - 2. Fabricate in accordance with Fig. 6-1.
 - 3. Fabricate plenum using same material and pressure class as connecting duct.
 - 4. Paint exterior side of plenum flat black.

2.3 MANUFACTURED DUCTWORK AND FITTINGS

- A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Flexible Ducts: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
 - 1. Insulation: Fiberglass insulation with polyethylene vapor barrier film.

2. Insulation thickness shall be 1 inch thick, minimum; 3/4 lbs./cu ft., minimum.
 3. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
 4. Maximum Velocity: 4000 fpm.
 5. Temperature Range: Minus 20 degrees F to 210 degrees F.
 6. Manufacturers:
 - a. Atco Rubber Products, Inc.; Model UPC-037: www.atcoflex.com.
 - b. Flexible Technologies Group-Thermafex, Inc.; Model M-KE: www.thermafex.net
 - c. Flexmaster USA; Model Type 3M: www.flexmasterusa.com.
 - d. Wiremold, Inc.; Model WK: www.wiremold.com.
- C. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- C. Duct sizes for runouts to grilles, registers and diffusers shall match the size of the device unless otherwise noted.
- D. Duct Cleanliness level: Advanced Level in accordance with SMACNA Duct Cleanliness for New Construction Guidelines.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- F. Use double nuts and lock washers on threaded rod supports.
- G. Seal all transverse and longitudinal joints in all metal supply, exhaust and return ducts.

3.2 SCHEDULES

- A. Ductwork Material:
 1. General Exhaust: Galvanized Steel.
- B. Ductwork Pressure Class:

1. General Exhaust: 2 inch negative.

END OF SECTION

SECTION 23 3300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Volume control dampers.

1.2 RELATED REQUIREMENTS

- A. Section 23 3100 - HVAC DUCTS AND CASINGS.

1.3 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2012.
- B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

1.4 SUBMITTALS

- A. Refer to Section 23 0510 - General HVAC Requirements for submittal procedures.
- B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.

PART 2 PRODUCTS

2.1 VOLUME CONTROL DAMPERS (MVD).

- A. Manufacturer: Ruskin MD35.
- B. Other acceptable manufacturers offering equivalent products: Airstream, Arrow, Greenheck, Nailor Industries, National Controlled Air, Prefco, Pottorff.
- C. Single Blade Dampers: Figure 7-4. Fabricate for duct sizes up to 6 x 30 inch.
- D. Multi-Blade Damper: Figure 7-5. Fabricate of opposed blade pattern with maximum blade sizes 8 x 48 inch long. Assemble center and edge crimped blades in galvanized channel frame with suitable hardware; 16 gauge, minimum, steel channel frame with blade stops top and bottom; 16 gauge steel blades with formed edge groove to have 3/8 inch interlock between adjacent blades, with 1/2 inch diameter cadmium plated shaft extended 6 inches beyond frame and blade linkage.
- E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- F. Quadrants:
 - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.

2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 23 3100 for duct construction and pressure class.
- B. Volume Control Dampers:
 1. Install where shown on drawings or required by details.
 2. Lock all volume control dampers in the full open position for adjustment by the TAB agency.

END OF SECTION

SECTION 23 3423

HVAC POWER VENTILATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Inline centrifugal fans.

1.2 RELATED REQUIREMENTS

- A. Section 23 0513 - MOTORS FOR HVAC EQUIPMENT.
- B. Section 26 2717 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

- A. AMCA (DIR) - [Directory of] Products Licensed Under AMCA International Certified Ratings Program; Air Movement and Control Association International, Inc.; <http://www.amca.org/certified/search/company.aspx>.
- B. AMCA 99 - Standards Handbook; Air Movement and Control Association International, Inc.; 2010.
- C. AMCA 204 - Balance Quality and Vibration Levels for Fans; Air Movement and Control Association International, Inc.; 2005.
- D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; Air Movement and Control Association International, Inc.; 2007 (ANSI/AMCA 210, same as ANSI/ASHRAE 51).
- E. AMCA (DIR) - [Directory of] Products Licensed Under AMCA International Certified Ratings Program; Air Movement and Control Association International, Inc.; <http://www.amca.org/certified/search/company.aspx>.
- F. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; Air Movement and Control Association International, Inc.; 2014.
- G. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; Air Movement and Control Association International, Inc.; 2014.
- H. UL 705 - Power Ventilators; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. Refer to Section 23 0510 - General HVAC Requirements for submittal procedures.
- B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

- C. Manufacturer's Instructions: Indicate installation instructions.
- D. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.
- E. Maintenance Materials: Furnish the following for the Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Fan Belts: One set for each individual fan.

1.5 QUALITY ASSURANCE

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND PROTECTION

- A. Refer to Section 23 0510 - General HVAC Requirements for delivery, storage and protection requirements.
- B. Do not operate units until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.7 FIELD CONDITIONS

- A. Permanent ventilators may be used for ventilation during construction only after ductwork is clean, filters are in place, bearings have been lubricated, and fan has been test run under observation.

1.8 EXTRA MATERIALS

- A. See Section 01 6000 - Product Requirements, for additional provisions.
- B. Provide a second adjustable sheave for each belt driven fan to place belt at mid-position of sheave at RPM required for final air balance.

PART 2 PRODUCTS

2.1 POWER VENTILATORS - GENERAL

- A. Static and Dynamically Balanced: AMCA 204 - Balance Quality and Vibration Levels for Fans.
- B. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
- C. Sound Ratings: AMCA 301, tested to AMCA 300 and bearing AMCA Certified Sound Rating Seal.
- D. Fabrication: Conform to AMCA 99.
- E. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

- F. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.2 INLINE CENTRIFUGAL FANS(ILC)

- A. Manufacturers: Acme XB, Breidert BIC, Cook SQI, Greenheck BSQ, Peerless Centrifan, PennBarry SX, Twin City ILB.
- B. Motor: Refer to Section 23 0513.
- C. Fan Unit: Air foil centrifugal fan with V-belt as indicated, aluminum wheel, belt guard, companion flanges, inlet cone, flow vanes, grease lubricated with external fittings, and access door.
- D. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor. Provide NEMA 1 housing for interior locations and NEMA 3R for exterior locations.
- E. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked.
- F. Drive and Sheaves: Drives rated at 1.5 time motor HP, minimum. Cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

PART 3 EXECUTION

3.1 PREPARATION

- A. Seal all duct roof penetrations at roof structure air-tight.
- B. Ensure exhaust duct is clean and free of debris.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Suspended Fans:
 - 1. Install fans with resilient mountings and flexible electrical leads. Refer to Section 23 0548.
 - 2. Install flexible connections specified in Section 23 3300 between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.
- C. Provide a second adjustable sheave to place belt at mid-position of sheave at RPM required for final air balance.
- D. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

3.3 STARTING EQUIPMENT

- A. Adjust for proper operation within manufacturer's published tolerances.

B. Demonstrate proper operation of equipment to the Owner 's designated representative.

3.4 SCHEDULES

A. Refer to Schedule on Drawings.

END OF SECTION

SECTION 23 3700
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Registers/grilles
- B. Louvers

1.2 SUBMITTALS

- A. Refer to Section 23 0510 - General HVAC Requirements for submittal procedures.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

PART 2 PRODUCTS

2.1 CEILING GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES (CGC)

- A. Manufacturer: Titus Model 50F
- B. Other acceptable manufacturers offering equivalent products:
 - 1. Anemostat GC5
 - 2. Carnes RAPAF
 - 3. Price 80
 - 4. Krueger RA
 - 5. Nailor 51EC.
 - 6. MetalAire CC5
 - 7. Tuttle & Bailey CRE500
- C. Type: Fixed grilles of 1/2 x 1/2 x 1/2 inch eggcrate grid core.
- D. Fabrication: Aluminum with factory off-white enamel finish.
- E. Frame: 1-1/4 inch margin with countersunk screw mounting.
- F. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.2 WALL SUPPLY REGISTERS/GRILLES- HEAVY DUTY(WSAR-HD):

- A. Manufacturer: Titus Model 300RL-HD.
- B. Other acceptable manufacturers offering equivalent products:
 - 1. Anemostat.
 - 2. Carnes.
 - 3. Price.
 - 4. Krueger 620/F/D.
 - 5. MetalAire V4004S-AF.
 - 6. Tuttle & Bailey T647.
- C. Type: Streamlined and individually adjustable blades, 1/2 inch minimum depth, 1/2 inch maximum spacing with spring or other device to set blades, horizontal face, double deflection.
- D. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.
- E. Fabrication: Steel with 18 gage minimum frames and 14 gage minimum blades with factory baked enamel finish, color to be selected.
- F. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

2.3 WALL EXHAUST AND RETURN REGISTERS/GRILLES-HEAVY DUTY(WRAG-HD)

- A. Manufacturer: Titus Model 33RL.
- B. Other acceptable manufacturers offering equivalent products:
 - 1. Anemostat EHDD.
 - 2. Carnes RSHA.
 - 3. Price GG95L.
 - 4. Krueger S-480-H.
 - 5. MetalAire - 4500.
 - 6. Tuttle & Bailey RUD.
- C. Type: 14 gauge streamlined blades, 3/4 inch minimum depth, 1/2 inch maximum spacing, with 0 degree fixed blade deflection, horizontal face.
- D. Frame: 16 gauge 1-1/4 inch margin with countersunk screw mounting.
- E. Fabrication: Steel frames and blades, with factory finish.

- F. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.4 LOUVERS-ALUMINUM-DRAINABLE BLADE STYLE

- A. Manufacturer: Ruskin Model ELF-6375DX.
- B. Other acceptable manufacturers offering equivalent products:
 - 1. American Warming & Ventilating LE-33.
 - 2. Air Balance.
 - 3. Arrow EA-615-D.
 - 4. Dowco DW-6.
 - 5. Greenheck ESD-603.
 - 6. Industrial Louvers 653.
 - 7. Louvers & Dampers IEL-6.
 - 8. Shipman LE-33.
 - 9. Tuttle & Bailey DB-645.
- C. Type: 6 inch deep with blades on 45 degree slope, drainable blade with gutter, heavy channel frame, 19 gauge birdscreen with 1/2 inch square mesh for exhaust and 3/4 inch for intake.
- D. Fabrication: 12 gage thick extruded aluminum, welded assembly, with factory baked enamel finish color to be selected.
- E. Mullions: Provide hidden or exposed mullions to support blades as shown on architectural elevations.
- F. Mounting: Furnish with masonry strap anchors for installation.
- G. Insulated Blank-Off Panels:
 - 1. Fabricate louver blank-off panels of materials and sizes indicated and to comply with the following requirements:
 - a. Finish: Match finish applied to louver with respect to coating type, except for color, which shall be flat black.
 - b. Attach blank-off panels to back of louver frames with stainless-steel sheet-metal screws.
 - 2. Blank-Off Panels: Laminated metal-faced panels consisting of insulating core surfaced on back and front with metal sheets, complying with the following requirements:
 - a. Thickness: 2 inches (50 mm).

- b. Metal Facing Sheets: Aluminum sheet, 0.032 inch (0.81 mm) thick.
- c. Insulating Core: Unfaced, rigid, glass-fiberboard insulation complying with ASTM C612, Class 1 and Class 2.
- d. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames 0.081 inch (2.06 mm) thick, with corners mitered and with same finish as panels.
- e. Seal perimeter joints between panel faces and louver frames with 1/8 inch by 1 inch (3.2 mm by 25 mm) polyvinyl chloride compression gaskets.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 9123.

3.2 AIR OUTLET AND INLET SCHEDULE

- A. Refer to Schedule on Drawings.

END OF SECTION

SECTION 23 4000
HVAC AIR CLEANING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Disposable panel filters.

1.2 RELATED SECTIONS

- A. Section 23 0510 - General HVAC Requirements - Space Conditioning during construction and building flushout.
- B. Section 23 0519 - Gages and Meters - Filter Gages.

1.3 REFERENCE STANDARDS

- A. UL 900 - Standard for Air Filter Units; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. Refer to Section 23 0510 - General Mechanical Requirements for submittal procedures.
- B. Product Data: Provide data on filter media, filter performance data, filter assembly and filter frames, dimensions, motor locations and electrical characteristics and connection requirements.
- C. Maintenance Materials: Furnish the following for the Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Provide filters whenever any system is operated during construction. Refer to Section 23 0510.
 - 3. For every system requiring filters;
 - a. Provide and install one set of new disposable panel filters at Material Completion.
 - b. Provide one set of spare disposable panel filters at Material Completion.

PART 2 PRODUCTS

2.1 DISPOSABLE PANEL FILTERS

- A. Media: UL 900 Class 2, fiber blanket, factory sprayed with flameproof, non-drip, non-volatile adhesive.
 - 1. Nominal Size: 12 x 24 inches.
 - 2. Thickness: 1 inch.

B. Performance Rating:

1. Face Velocity: 500 FPM.
2. Initial Resistance: 0.15 inch WG.
3. Recommended Final Resistance: 0.50 inches WG.

C. Casing: Cardboard frame.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install air cleaning devices in accordance with manufacturer's instructions.
- B. Prevent passage of unfiltered air around filters with felt, rubber, or neoprene gaskets.
- C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with clean set.

END OF SECTION

SECTION 23 8101

TERMINAL HEAT TRANSFER UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Electric heaters.

1.2 RELATED REQUIREMENTS

- A. Section 23 0510 - General HVAC Requirements - Submittals
- B. Section 26 2717 - Equipment Wiring: Electrical characteristics and wiring connections. Installation of room thermostats. Electrical supply to units.

1.3 SUBMITTALS

- A. Refer to Section 23 0510 - General HVAC Requirements for submittal procedures.
- B. Product Data: Provide typical catalog of information including arrangements.
- C. Refer to Submittals in Section 23 0510 for requirements regarding Tabulation of Power Wiring Requirements.
- D. Manufacturer's Instructions: Indicate installation instructions and recommendations.
- E. Operation and Maintenance Data: Include manufacturers descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

1.4 QUALITY ASSURANCE

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.5 DELIVERY, STORAGE, AND PROTECTION

- A. Refer to Section 23 0510 - General HVAC Requirements for general delivery, storage and protection requirements.
- B. Do not operate duct mounted equipment until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

PART 2 PRODUCTS

2.1 ELECTRIC WALL HEATERS(EWH)

- A. Manufacturer: Qmark Model AWH-4000.
- B. Other acceptable manufacturers offering equivalent products: Berko FRC, Electromode RFAC, Erincraft AWH, Markel 3400, Raywall AFA, Singer Series 5900.

- C. Assembly: UL listed and labelled with terminal box and cover, and built-in controls.
- D. Heating Elements: Enclosed copper tube, aluminum finned element of coiled nickel-chrome resistance wire centered in tubes and embedded in refractory material.
- E. Enclosure: Minimum 0.030 inch steel box for recessed mounting with removable 16 gauge steel bar grille with satin finished aluminum frame.
- F. Fan: Direct drive propeller type, statically and dynamically balanced.
- G. Motor: Permanently lubricated, sleeve bearings.
- H. Built-in Controls:
 - 1. Power disconnect switch.
 - 2. Automatic reset thermal overload protector.
 - 3. Tamper-proof bi-metal thermostat with 40-90 Degree F range adjustable through grille face.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install terminal units in a readily accessible location.
- C. Install equipment exposed to finished areas after walls and ceiling are finished and painted. Do not damage equipment or finishes.
- D. Protection: Provide finished cabinet units with protective covers during balance of construction.
- E. Install electric heating equipment including devices furnished by manufacturer but not factory-mounted. Furnish copy of manufacturer's wiring diagram submittal.

3.2 CLEANING

- A. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

3.3 SCHEDULES

- A. Refer to Schedules on the Drawings.

END OF SECTION

SECTION 23 8113

PACKAGED TERMINAL AIR-CONDITIONERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Unitary air conditioners.

1.2 RELATED REQUIREMENTS

- A. Section 23 0510 - General HVAC Requirements.
- B. Section 23 0513 - Common Motor Requirements for HVAC Equipment: Evaporator and condenser fan motors.
- C. Section 26 2717 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilation Systems; National Fire Protection Association; 2009.

1.4 SUBMITTALS

- A. See Section 23 0510 - General HVAC Requirements, for submittal procedures.
- B. Product Data: Provide data for manufactured products and assemblies. Indicate water, drain, thermostatic valves, and electrical rough-in connections with electrical characteristics and connection requirements.
- C. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions.
- D. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in the Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide a five year warranty to include coverage for refrigeration compressors.

PART 2 PRODUCTS

2.1 AIR CONDITIONING UNITS

- A. Description: Packaged, self-contained, factory assembled, prewired unit, consisting of cabinet, compressor, condensing coil, evaporator fan, evaporator coil, outside air connection, heating coil, air filters, and controls; fully charged with refrigerant and filled with oil.
- B. Assembly: Up flow air delivery, in draw-through configuration as indicated.

2.2 CABINET

- A. Frame and Panels: Galvanized steel with baked enamel finish, easily removed access doors or panels with quick fasteners to provide access to all interior components..
- B. Insulation: Minimum 1/2 inch thick acoustic duct liner for lining cabinet interior.
- C. Provide mounting brackets with rubber isolators for horizontal units.
- D. Drain Pan: Galvanized steel with corrosion-resistant coating and with insulation on all surfaces subject to condensation.

2.3 EVAPORATOR FAN

- A. Fan: Direct drive, double width, double inlet, forward curved centrifugal fan, statically and dynamically balanced, resiliently mounted.
- B. Fan/motor assembly shall be easily removable for service.
- C. Motors: Single phase, 60 Hz; multi-speed PSC type with internal overload protection.

2.4 COMPRESSOR

- A. Hermetically sealed, 3600 rpm maximum, resiliently mounted with positive lubrication and internal motor protection.

2.5 EVAPORATOR COIL

- A. Direct expansion coiling coil of seamless copper or aluminum tubes expanded into aluminum fins.
- B. Refrigeration circuit with externally equalized thermal expansion valve, filter-drier, and charging valves.

2.6 REFRIGERANT CIRCUIT

- A. Provide each unit with one refrigerant circuit, factory supplied and piped.
- B. For each refrigerant circuit, provide:
 - 1. Thermal expansion valve for maximum operating pressure.
 - 2. Insulated suction line.

3. Suction and liquid line service valves and gage ports.
 4. Charging valve.
- C. For heat pump units, provide reversing valve, suction line accumulator, discharge muffler, flow control check valve, and solid-state defrost control utilizing thermistors.

2.7 CONDENSER

- A. Co-Axial, copper tube in copper tube or shell and tube with finned copper tubes in steel shell with water temperature actuated water regulating valve.
- B. Fan: Double width, double inlet, forward curved centrifugal fan, statically and dynamically balanced, with permanently lubricated bearings.
- C. V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.

2.8 HEATING COIL

- A. Helical nickel-chrome resistance wire coil heating elements with refractory ceramic support bushings, with automatic reset thermal cut-out, built-in magnetic contactors, manual reset thermal cut-out, airflow proving device, load fuses.

2.9 AIR FILTERS

- A. Easily removed 1 inch thick disposable glass fiber panel filters.

2.10 CONTROLS

- A. Factory wired controls shall include contactor, high and low pressure cutouts, internal winding thermostat for compressor, control circuit transformer, non-cycling adjustable (0-5 minutes) time delay relay to delay compressor operation after unit is commanded ON.
- B. Provide thermostat to cycle cooling, mounted within unit with 'fan-off-cool' switch allowing continuous fan operation, or cycling fan on call for cooling.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.2 SCHEDULES

- A. Refer to Schedule on Drawings.

END OF SECTION

SECTION 23 8122

PACKAGED SELF CONTAINED WALL MOUNTED HEAT PUMP

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Packaged wall hung heat pumps.
- B. Controls.

1.2 RELATED SECTIONS

- A. Section 23 0510- General Mechanical Requirements.
- B. Section 23 0513 - Motors for HVAC Equipment.

1.3 REFERENCES

- A. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; Air Movement and Control Association International, Inc.; 1996.
- B. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; Air Movement and Control Association International, Inc.; 1990.
- C. ANSI/ARI 390 - Single Package Vertical Units, 2003.
- D. ARI 1060 - Rating for Air-to Air Energy Recovery Ventilation Equipment Cassettes.
- E. ARI 270 - Sound Rating of Outdoor Unitary Equipment; Air-Conditioning and Refrigeration Institute; 1995.
- F. ARI 410 - Standard for Forced-Circulation Air-Cooling and Air-Heating Coils; 1991.
- G. NEMA MG 1 - Motors and Generators; 1993 (and Revision 1,2,3).
- H. NFPA 70 - National Electrical Code 2014.
- I. UL 900 - Standard for Air Filter Units; 1994.

1.4 SUBMITTALS

- A. See Section 23 0510 - General Mechanical Requirements, for additional submittal requirements.
- B. Product Data:
 - 1. Published Literature: Indicate dimensions, weights, capacities, ratings, gages and finishes of materials, and electrical characteristics and connection requirements.
 - 2. Filters: Data for filter media, filter performance data, filter assembly, and filter frames.

3. Fans: Performance and fan curves with specified operating point clearly plotted, power, RPM.
 4. Controls: Product data for thermostats, humidistats and wiring diagrams.
 5. Sound Power Level Data: Fan outlet and casing radiation at rated capacity.
 6. Electrical Requirements: Power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.
- C. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements.
- D. Manufacturer's Instructions: Include installation instructions.
- E. Maintenance Data: Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.
- F. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in the Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND PROTECTION

- A. Accept products on site in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs. Inspect for damage.
- B. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.
- C. Do not operate units until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.7 EXTRA MATERIALS

- A. Maintain filters during construction. Provide new filters at Final Inspection.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Wall Hung Heat Pump Unit
1. Design Basis Manufacturer
 - a. Bard; Model TxxH Series.
 2. Other Acceptable Manufacturers:

a. Marvair.

2.2 HEAT PUMP UNITS (WMHP)

- A. Description: Packaged, air cooled, factory assembled, pre-wired and pre-piped unit, consisting of cabinet, fans, filters, compressor(s), condenser, energy recovery wheel, dehumidification coil, hot gas reheat coil, electric resistance back-up heater, and prewired controls. Entire assembly shall be designed for self-contained, exterior wall mounting suitable for outdoor use as scheduled.
- B. Assembly: Up-flow air delivery, in draw-through configuration.
- C. Cabinet and Frame:
1. Structural Frame: 20 gage welded steel suitably braced for rigidity, capable of supporting compressors and other mechanical equipment and fittings. All cabinet fasteners shall be tamper resistant.
 2. Doors and Access Panels: 20 gage steel with same finish as cabinet, polyurethane gaskets, hinged and lockable for access to primary functional electrical controls.
 3. Insulation: Thermally and acoustically line cabinet interior with 1 inch thick, high density fiberglass insulation with sealed edge treatment. Provide additional sound deadening insulation material in the compressor section. Insulation shall not promote mold and mildew growth and shall facilitate cleaner.
 4. The outdoor coil and fresh air intake opening shall be protected by a sturdy metal grating.
 5. Built-in full length mounting brackets.
 6. Provide a slope top with top rain flashing for exterior units.
 7. Finish of Exterior Surfaces: Baked-on textured polyester enamel; color as selected by Architect.
- D. Evaporator Fans and Motor:
1. Fans: Double inlet, forward curved centrifugal fans, statically and dynamically balanced, variable speed ECM, high efficiency, soft start capability, directly driven. with phase rotation monitor.
 2. Shafts: Solid, hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.
- E. Compressor:
1. Hermetically sealed, scroll, 3600 rpm maximum, resiliently mounted with positive lubrication and internal motor protection with suction and discharge gage ports..
- F. Evaporator Coils:
1. Direct expansion cooling coils of seamless, grooved copper tubes expanded into aluminum fins in A-frame configuration.

2. Mount coil assembly in galvanized steel drain pan with polyester enamel coating.

G. Condenser Coil:

1. Provide copper tube aluminum fin coil assembly with subcooling rows and coil guard.
2. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Provide high efficiency fan motors.
3. Condenser fan, motor and shroud shall be on a pull out assembly for maintenance access.

H. Hot Gas Reheat Coil:

1. Provide copper tube aluminum fin coil assembly.

I. Refrigerant Circuit:

1. Refrigerant metering control devices with liquid line filter dryer.
2. HGR valve.
3. R-410A refrigerant.

J. Electric Heat:

1. Assembly: UL listed and labelled assembly with steel frame and side mounted control cabinet and cover, and built-in controls.
2. Heating Elements: Exposed helical coil of nickel-chrome resistance wire with refractory ceramic support bushings.
3. Control Cabinet: 0.0478 inch steel with hinged front panel with latching disconnect switch.
4. Built-in Controls: Disconnect in control panel face, mercury controlling contactors, manually resettable thermal cut-outs, 24 Volt control transformer, circuit fuses for heaters over 48 Amps, factory wired differential air-flow switch and terminal blocks.

K. Filters:

1. Media: Pleated, lofted, non-woven, reinforced cotton fabric; supported and bonded to welded wire grid; enclosed in cardboard frame; 2 inch nominal thickness, MERV-8.

L. Outside Air Damper Assembly:

1. Built-in energy recovery ventilator

M. Energy Recovery Ventilator:

1. The exhaust air rate shall be equal to the ventilation air rate. The ERV assembly shall include intake and exhaust blowers with multi-speed fan selections.

2. Wheel: Material shall be polymer with permanently bonded silica gel dry desiccant, cleanable by washing with detergent and warm water without degradation to heat transfer performance.
3. Bearings shall be permanently lubricated, oil filled, bronze ball bearings and the shaft shall be stainless steel.
4. Air seal: Pile type perimeter seal to prevent air flow around the wheel.
5. Ventilator assembly shall be equipped with a plug-in type connector for ease of removal of the cassette for cleaning and servicing. The remainder of the unit shall be capable of remaining operable while the wheel is being serviced.
6. The energy transfer material shall meet UL requirements for flame and smoke spread ratings.

N. Electrical Panel:

1. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated.
2. Control Cabinet: NEMA 250; Type 2 enclosure, UL listed, with piano hinged door, grounding lug, starters with overload relays, power disconnect, and fusible control circuit transformer.
3. Disconnect Switch: Non-automatic molded case circuit breaker with handle accessible with panel closed and capable of preventing access until switched to "off" position.

O. Solid State Heat Pump Control System:

1. Safety controls
 - a. High discharge pressure switch.
 - b. Low suction pressure switch.
 - c. Rotation protection and phase failure protection
2. Operating controls
 - a. Provide electronic programmable room thermostat with auto changeover to control compressors, electric coil, and supply fan to maintain temperature setpoint.
 - b. Provide dehumidification cycle with HGR coil to maintain humidity of room humidistat during ON and OFF hours.
 - c. Programming based on weekdays, Saturday and Sunday.
 - d. Set-up for four separate temperatures per day.
 - e. Provide terminal strip and necessary auxiliary contacts on unit for connection and interface with building fire alarm system.

- f. Provide 30 minute defrost cycle.
- g. Short cycle protection.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Refer to Detail on Drawings.
- C. Install mounting brackets and mount unit to wall.
- D. Install flashing and make exterior opening weatherproof.
- E. Seal duct penetrations through exterior walls.
- F. Evaporator Drain Pan: Route discharge from cooling coil drain pan to within 6 inches of grade with drawn copper tube, full size of connection.
- G. Condenser Drain: Route discharge from condenser drain to evaporator coil drain.
- H. Provide and install communication cable between thermostat and/or humidistat and packaged unit control panel.

3.2 STARTING EQUIPMENT AND SYSTEMS

- A. Adjust for proper operation within manufacturer's published tolerances.
- B. Demonstrate proper operation of equipment to the Owner 's designated representative.

3.3 CLEANING AND PROTECTION

- A. Do not operate units with until building is broom clean and all GWB finish work is complete.
- B. Do not operate units with outside air dampers open while performing site work.
- C. Protect installed units and unit casing from subsequent construction operations and exterior construction work in and around the units.

3.4 SCHEDULES

- A. Refer to schedule on Drawings.

END OF SECTION

SECTION 26 0002

ELECTRICAL SPECIFICATIONS

1.1 26 0501 EXISTING CONDITIONS

- A. The demolition plan (where shown) has been prepared to assist the Contractor in determining the scope of demolition work and should not be construed to be all of the demolition required. The Contractor shall visit job site (after carefully reviewing the contract documents) and determine exact areas and quantities of existing materials to be removed to accomplish new construction.
- B. Notice of Outages: Notify the Architect and Owner, at least seven working days in advance, before partially or completely disabling a system. The Owner needs time to coordinate outages with the Owner's departments and personnel. If the Contractor requests outage with less advance notice, the Owner may assist the Contractor at the Owner's option.
- C. Where existing circuits to remain are inadvertently damaged or disturbed, replace or repair the damaged portion of the circuit. The finished work shall conform to this specification for new work between remaining portions of the work around the removed work. Where circuit portions are removed by this work, reconnect circuits, re-route circuits, and provide circuit portions as required to maintain circuit continuity. Provide new conduit between remaining portions of the circuit. Provide new conductor of the same description between the first existing boxes, or provide boxes in accessible locations.
- D. Conduit to be demolished shall be removed in its entirety from accessible locations. Inaccessible conduit shall be cut and plugged and the adjacent surface patched to match adjacent surface. Disconnect abandoned outlets and remove devices and circuiting. Remove abandoned outlets. In remaining walls, patch and finish the outlet to match the surrounding wall. Disconnect and remove electrical devices serving equipment that has been removed. Disconnect and remove abandoned luminaries. Remove brackets, stems, hangers, and other accessories.
- E. Remove out-of-service communications cables including but not limited to telephone, computer, TV, antenna. Out-of-Service shall be defined as follows: Cables which have one or both ends disconnected from jacks or equipment. Cables which the Owner has tagged as "DEMOLISH", and the Owner has disconnected or cut the cable.
- F. Hazardous Materials:
 - 1. A/E's Responsibility: Plans and specifications have been prepared by the A/E for the Owner without the A/E having conducted investigation as to the presence of asbestos or hazardous waste on the project. Not being a part of this contract, the A/E has not charged any fees and has not and will not advise the Owner with regard to the detection and/or removal of asbestos or hazardous waste. The Owner is aware that asbestos or hazardous waste could be present and will make all decisions with regard to its removal. The removal of all hazardous materials and encapsulation of remaining surfaces is the sole responsibility of the Owner.
 - 2. If the Contractor observes the existence of a friable material which must be disturbed during the course of his work, the Contractor shall promptly notify the Owner and the

Architect. The Owner shall make all arrangements regarding testing and removal or encapsulation of asbestos material if present. The Contractor shall not perform any work pertinent to the friable material prior to receipt of special instructions from the Owner through the Architect.

3. "Friable Material" is any material which can be crumbled, pulverized or reduced to a powder by hand pressure when dry.

1.2 26 0510 GENERAL ELECTRICAL REQUIREMENTS

A. General Items:

1. Drawings are diagrammatic and show the general location of the equipment, raceway, and equipment, but are not to be scaled. All dimensions shall be verified at the building site. Prefabrication and/or installation of work from drawings shall be at the Contractor's risk. Refer to Architectural plans and sections for exact building dimensions and details.
2. Provide housekeeping and equipment pads where penetrations occur through any slab in the electrical rooms. Any conduit that penetrates the slab and is exposed in the space shall be wrapped in a housekeeping pad. All electrical items that sit on the slab shall have housekeeping pads below. Rough up slab under bases before pouring concrete.
3. Where penetrations are made in fire rated partitions, walls, floors or ceilings during the course of electrical installation, these penetrations shall be restored to their intended fire ratings by the use of fittings or materials as approved by Underwriter's Laboratories for this purpose.
4. Instruct operating personnel designated by the Owner in operation and maintenance of the fire alarm system prior to the request for final inspection. A manufacturer's service representative shall provide the instructions (Instructor shall not be a sales person, but shall be one with service experience on a continuing basis, knowledgeable about the subject equipment.) The Owner will record (audio or video/audio) operating instructions given by the Contractor to the operating personnel.
5. Regulatory Requirements
 - a. Where requirements of these specifications exceed specified codes and ordinances, conform to these specifications.
 - b. Materials and equipment included in Underwriters Label Service shall bear that label. Electrical equipment shall be U.L. approved as installed.
 - c. Jurisdiction: Where codes or guides refer jurisdiction to local governing code officials, such official in this procedure shall be the State Fire Marshal.
 - d. Permits: Obtain all permits, paying all fees in connection therewith. At completion, have work inspected by proper authorities and furnish the Design Professional an inspection certificate showing approval of installation.
 - e. The Code currently adopted and presently in effect is the 2009 International Energy Conservation Code with all Georgia State Amendments.

- f. Fire Prevention: Conform to 2012 International Fire Code with all Georgia State Amendments.
 - g. Building Code: Conform to the 2012 International Building Code with all Georgia State Amendments.
 - h. Electrical: Conform to the 2014 National Electrical Code (NEC), with any GA amendments, NFPA, and the National Electrical Safety Code.
 - i. Accessibility: Americans with Disability Act.
- B. Submittals: Submit electrical items prior to purchase, for confirmation of acceptance. The purpose of submittals is to demonstrate that the Contractor understands the design concept of the project by indicating the equipment and materials he intends to furnish and install, and by detailing the installation he intends to achieve. The review by the Design Professional shall NOT be construed to be for the purpose of "approving" equipment or drawings. Items to submit (not all inclusive - see individual sections for additional requirements):
- 1. Submit a power wiring letter indicating coordination between the mechanical equipment to be purchased and the electrical breaker shown powering it. Failure to submit this letter will require the Contractor to assume responsibility for any required changes to the electrical design attributed to mechanical equipment. Include a copy of the Tabulated List of Power Wiring Requirements with the letter. The electrical requirements for the mechanical equipment is based on the best information available at the time of design.
 - 2. Submit certificates for Fire Alarm System. Provide shop drawings prior to installation.
 - 3. Operating and Maintenance manuals: at the end of the project provide a binder that contains shop drawings, wiring diagrams, as built, warranty information and sign in sheets for all owner training sessions.

1.3 26 0519 LOW VOLTAGE POWER CONDUCTORS

A. Design Intent:

- 1. Provide copper conductors, THHN/THWN insulation.
- 2. All conductors shall be made in the USA.
- 3. Provide solid conductors for circuits #10 AWG and smaller, stranded for larger.
- 4. MC cable may not be used for any circuiting in this building.
- 5. Provide a dedicated neutral conductor for all branch circuits. THERE SHALL BE NO SHARED NEUTRAL CONDUCTORS.

B. Color Code:

- 1. 208Y/120 V, 3 Phase, 4 Wire System:
 - a. Phase A: Black.
 - b. Phase B: Red.

- c. Phase C: Blue.
- d. Neutral/Grounded: White.
- 2. Equipment Ground, All Systems: Green.
- C. Submittal Requirements: NONE

1.4 26 0534 CONDUIT

A. Design Intent:

- 1. All conduit shall be made in the USA.
- 2. All new conduit must be painted to match the surrounding wall or ceiling color.
- 3. Use EMT conduit in dry spaces inside the building, 1/2" minimum unless the drawings indicate something larger. Where conflicting sizes are shown, install the larger size.
- 4. Transition to Rigid Metal Conduit for devices on the roof.
- 5. Liquid tite flex may be used where noted on the drawings.
- 6. Low voltage conduit shall be 1", except where noted otherwise on the drawings.
- 7. Low voltage conduit shall stub out of wall and continue out the corridor J hooks or cable tray, whichever is used per the drawings. See the conduit description on the drawing. Conduit shall stub out to the corridor J Hooks or Cable tray. Conduit stubs shall not stop inside the room, with J hooks to the corridor.

B. Installation:

- 1. Unless dimensioned, conduit routing indicated is diagrammatic.
- 2. When conduit destination is indicated and routing is not shown, determine exact routing required.
- 3. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
- 4. Join EMT conduit together with set screw connectors.
- 5. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
- 6. Provide #16 galvanized pullwire or minimum 200 lb. polyolefin pull cord in each empty conduit except sleeves and nipples.
- 7. Install firestopping to preserve fire resistance rating of partitions and other elements.

C. Submittal Requirements: NONE

1.5 26 0537 BOXES

- A. Design Intent: All boxes used in dry interior spaces shall be stamped metal type unless otherwise noted. Coordinate the size of the backbox required for the fire alarm devices with the manufacturer prior to purchase and rough in.
- B. Installation:
 - 1. Before stubbing outlets in an area, study the electrical drawings and architectural elevation views. Architectural elevation views shall govern outlet heights and orientation. Electrical drawings shall govern outlets quantity and approximate locations. Coordinate with the Architect for clarifications.
 - 2. Where outlets are shown above cabinets and casework, the outlets shall be mounted with the bottom of the device plates one inch above the backsplash or counter trim, and horizontally aligned.
 - 3. Typical backbox mounting heights include:
 - a. Receptacles: 18" AFF
 - b. Fire Alarm pull stations: 44" AFF
 - c. Fire Alarm Visual Strobe or Speaker: 83" or 6" below ceiling, whichever is lower. The strobe lens must not be lower than 80" AFF when installed. Coordinate this height with the windows in the classroom areas. See the plans for sections and detailed descriptions.
 - 4. Boxes in fire rated walls: Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified. Where boxes are located in fire rated walls the wall opening area shall be limited as required by NFPA. Where box openings exceed NFPA limits provide a two hour fire rated barrier around the back and sides of boxes, inside the wall. Construct the barrier with two hour rated material of the board type joined with two hour fire rated material of the caulk type.
 - 5. Use flush mounting outlet box in finished areas.
 - 6. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in acoustic rated walls.
 - 7. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

1.6 26 0553 IDENTIFICATION OF ELECTRICAL SYSTEMS

- A. Design Intent: Labeling circuits and panels is critical when renovating a space. There cannot be too much labeling.
- B. Devices to be labelled include:
 - 1. Panels, Transformers, Disconnects: Engraved type, white on black, indicating "Name" and "Fed by Panel-Circuit".

2. New panel directories will be required on any panel that any new work is performed. Where existing work is demolished, the breakers shall be labeled as "spare". If at any time an existing circuit has to be traced to find its origin and the device(s) that it serves; once this information is gathered, the circuit shall be clearly and permanently labeled in the existing panel and on the device in the method described by the detail on the sheet. New work indicated on the panel schedule shall be identified with the load and the room number.

C. Submittal Requirements: NONE

1.7 26 2416 PANELBOARDS

A. Description:

1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
2. Conductor Terminations: Aluminum, suitable for terminating aluminum or copper conductors.
3. Bussing: Aluminum
4. Circuit Breakers: Bolt on, thermal magnetic unless noted otherwise.
5. Enclosures: Provide surface-mounted or flush-mounted enclosures as indicated, and clear plastic circuit directory holder mounted on inside of door.
6. Load centers are not acceptable.
7. Manufacturers: Square D, Eaton, GE

B. Installation:

1. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
2. Housekeeping Pad: Provide 4 inch high, concrete housekeeping pad beneath each surface mounted panelboard. Pad shall extend one inch past panel perimeter on front and sides, with chamfered edge sized 1/2 inch to 3/4 inch. The concrete pad shall enclose all conduits feeding into the panelboard from the floor. This Pad is not required if there is no conduit from below.
3. Directory: Provide a typed circuit directory for each branch circuit panelboard. Directory serving lighting, outlets, or other items in spaces shall state an abbreviation of the type of load and the respective space numbers served.

C. Submittal Requirements: Submit panel data showing breaker arrangement, buss size and type, fault current capability, enclosure dimensions, and ground buss arrangement prior to purchase.

1.8 26 2726 WIRING DEVICES

A. Provide the following:

1. Wall Switches: 20A, Heavy Duty. IVORY in color.
2. Receptacles: NEMA 5-20, Heavy Duty. IVORY in color. GFI type where indicated. Provide a "while in use" cover for exterior receptacles at the outdoor air units.
3. Wall plates: Jumbo size, Brushed satin finish, Type 302 stainless steel.

B. Installation:

1. Provide GFI receptacles with integral GFI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
2. Where two or more devices are shown adjacent, they shall be mounted in ganged boxes and covered with one faceplate.

C. Submittal Requirements: Provide submittal data indicating device model number and color prior to purchasing.

1.9 26 2818 ENCLOSED SAFETY SWITCHES

- A. Design Intent: Provide Heavy Duty type with Externally operable handle interlocked to prevent opening front cover with switch in ON position. Provide fuses to match manufacturer's instructions. Label as described in the drawings. Provide NEMA 1 rating indoor, NEMA 3R outdoor.

1.10 26 5100 INTERIOR LIGHTING

- A. Design Intent: Furnish products as indicated on drawings and in specifications

B. Installation:

1. Wall mounted exit signs shall be mounted such that the bottom edge of the fixture is located a minimum of 7'6". Coordinate the location of the backbox with the ceiling and the top of the door frames. Locate the exit sign in the center of the space between the ceiling and the door frame where possible in areas where the ceiling is 12' and less. Areas where the ceiling is greater than 12' shall place the bottom of the exit sign at 7'6". Conditions on storefront at main lobby areas may require different heights. Coordinate with the architectural elevations prior to rough-in in finished spaces.
2. Grid Troffers: Provide two minimum 18 gauge galvanized steel hangar wires from diagonal corners of each fixture to structure.

C. Submittal Requirements: Submit fixtures for review prior to purchase.

1.11 26 5200 SENSOR LIGHTING CONTROL

- A. Design Intent: The objective of this section is to ensure the proper installation of the occupancy sensor based lighting control system so that lighting is turned off automatically after reasonable time delay when a room or area is vacated by the last person to occupy said room or area. The occupancy sensor based lighting control shall accommodate all conditions of space utilization and all irregular work hours and habits. Where applicable, occupancy sensors shall be wired in a "Manual ON/ Auto OFF" configuration.

B. Installation:

1. The location of sensors shown on the plans are diagrammatic only. Locate sensors to avoid interference with possible obstructions.
2. Provide all power/switch packs required to make the system fully functional. Usually, a minimum of one power/switch pack is required per circuit and/or area of control. However in some cases additional power/switch packs may be required. Contact manufacturer for final determination of power/switch packs required for this project.
3. Wall switches shown in spaces with occupancy sensors shall be wired to override the sensor so that the lights can be switched off manually.
4. In spaces shown with multiple sensors, wire the sensors in parallel so that either sensor can control all of the fixtures on that circuit.
5. Mount ceiling type devices in the center of a ceiling tile.

C. Submittal Requirements: Submit sensors for review prior to purchase.

1.12 26 XXXX STRUCTURED CABLING FOR VOICE, DATA AND COAX - INSIDE PLANT

- A. Design Intent - Voice/Data: Route BLUE CAT 6 plenum rated cable from the outlet shown back to the patch panel. Terminate both ends with RJ 45 connectors. Active equipment (handsets, hubs, switches, media converters, etc.) is not included in this contract unless otherwise noted.
- B. Design Intent - Pathways: Utilize EMT conduit from the device backbox out of the wall up to above the accessible ceiling. Once above the ceiling, transition to:
1. J hooks in the style of a double 2.5" Arlington loop #TL25 RC14D.
- C. Installer Qualifications:
1. The telecommunications installation contractor shall be licensed in the State of Georgia as a Low Voltage Licensed Telecommunications Contractor (LVLTC).
 2. The selected LVLTC shall be fully capable and experienced in the telecommunications distribution system to be installed.
 3. The LVLTC shall have a minimum of five (3) years of experience installing Structured Cabling Systems and be a certified installer of the approved cable/component system solution.
- D. Labeling Horizontal Cables:
1. Permanently secure the label within 6 inches from both ends of the cable and at all pull boxes.
 2. Label shall indicate patch panel and port to which the horizontal cable is terminated.
- E. Testing - Copper Cabling and Associated Equipment:

1. Test backbone cables after termination but before cross-connection.
2. Category 6 Links: Perform tests for wire map, length, DC continuity, attenuation, NEXT, PSNEXT, ELFEXT, PSELFEXT, return loss, and propagation delay.
3. Utilize a Level IIe tester for Category 6 link compliance. If any part of the installed system results in a "FAIL" indicator on the tester, the problem shall be analyzed and corrected.
4. Testers shall be correctly set to test the type and manufacturer of the horizontal cable used in the link being tested, including the correct NVP.

F. Submittal Requirements: Submit the cable test results.

1.13 26 6100 FIRE DETECTION AND ALARM

- A. Design Intent: The contractor shall install all conduit and backboxes where shown on the plans and as needed to extend the existing fire alarm system to include new devices shown. Provide all components necessary, regardless of whether shown in the contract documents or not.
- B. NOTE: All fire alarm conductors shall be installed in EMT conduit except that rigid metal conduit shall be used as required by the conduit section.
- C. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business. In addition:
 1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
 2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
 3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
 4. Contract maintenance office located within 50 miles of project site.
 5. Certified in Georgia as fire alarm installer.
- D. Operation:
 1. The system alarm operation subsequent to the activation of any manual station or duct detector in the DOAC's shall be as follows:
 - a. All audible alarm indicating devices shall sound an alarm signal until silenced by the alarm silence switch at the control panel.
 - b. All visible alarm indicating devices shall flash continuously until the Alarm Silence Switch is operated.
 - c. Subsequent zone alarms shall reactivate the alarm indicating devices.

- d. A supervised signal to notify the local fire department shall be activated from the Existing panel.
- e. Supervised relays interlocked with mechanical controls shall initiate the air handling/ventilation sequence in accordance with NFPA 90 and as specified elsewhere in these specifications and as shown on the plans. Provide relays adjacent to starting/control devices in separate enclosure painted red.

E. Devices:

1. Initiating:

a. Manual Pull Stations:

- 1) Manual pull stations shall be addressable. Pull stations shall contain electronics that communicate the station's status (alarm, normal) to the transponder over two wires which also provide power to the pull station. The address shall be set on the station. The station shall mechanically latch upon operation and remain so until manually reset by opening with a key common to all system locks.
- 2) The addressable manual station shall be capable of field programming of its "address" location.
- 3) There shall be no limit to the number of stations, detectors or Zone Adapter modules, which may be activated or "in alarm" simultaneously.

b. Photoelectric Detector Head:

- 1) The photoelectric type detector shall be a plug-in unit which mounts to a twist-lock base, and shall be UL approved.
- 2) The detectors shall be of the solid state photoelectric type and shall contain no radioactive material. They will use a pulsed infrared LED light source and be sealed against rear air flow entry.
- 3) There shall be no limit to the number of detectors which may be activated or "in alarm" simultaneously.

2. Notification:

a. Notification Appliances:

1) Audible and/or Visual Units:

- (a) Audible horn sound level shall be a minimum 90dBA at 10 feet.
- (b) Provide speakers and amplifiers as required for voice evacuation where required. See plans for speaker locations.
- (c) Any two visual strobes placed in the same field of view shall flash in synchronization. A new device adjacent to an existing device shall also be synchronized.

- (d) Note: Strobe lenses may not be lower than 80" AFF. This does not mean the backbox may be at 80", as this would have the strobe lens below 80". Where indicated as "at 80'", this means the bottom of the LENS. Strobes may be located higher than 80" AFF if intensity of strobe is increased to the point that effective intensity is the same as a 75 candela strobe placed at 80" AFF. Wall mounted strobes shall still be located minimum 6 inches below ceiling. Contractor shall submit calculations from fire alarm vendor showing no change in effective intensity for strobes mounted higher than 80" AFF.
- (e) Use minimum 75 candela intensity strobes. Strobes shall be xenon type or equivalent.
- (f) Flash rate of strobe shall be in the 1 to 2 Hz. range.
- (g) Maximum pulse duration of strobe shall be 0.2 seconds, with a maximum duty cycle of 40 percent.

F. Submittal Requirements:

1. Submit shop drawings for review prior to rough in.
2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
3. System zone boundaries and interfaces to fire safety systems.
4. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
5. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
6. List of all devices on each signaling line circuit, with spare capacity indicated.
7. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
8. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
9. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
10. Certification by the Contractor that the system design complies with the contract documents.
11. Training lesson plan outline.

END OF SECTION