Project Manual
For

Hawaii Health Systems Corporation

KVMH Imaging Department Renovations

Waimea, Kauai, Hawaii
Project No. 220038-01

Construction / Bid Documents

16 August 2021

G70

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SPECIFICATIONS

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SECTION 01010 – SUMMARY OF WORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. General description of the Project.
2. General requirements for the Project.

B. Related Sections:

1. Division 01 Sections.

1.02 PROJECT/WORK SUMMARY

A. Project Summary: The Work consists but not limited to the following:

1. Demolition summary is as specified in Section 02070 – SELECTIVE DEMOLITION.
2. Alterations consists of the renovation of patient treatments rooms, patient toilets, staff work areas and corridor. Work to included structural, mechanical, plumbing, and electrical work as indicated on the Drawings.

B. Contract Documents:

1. List of Documents: All of the following documents apply to the Contract.
   a. Drawings:
      i. Bound hardcopy set of G70 and their consultants bound therein.
   b. Project Manual:
      i. Bound hardcopy set of “Project Manual” of G70 and their Consultants bound therein.
   c. Other: As included in listing of Contract between Owner and Contractor.
   d. Available Informative Documents, Reports and Data not part of the Contract Documents can be made available by Owner as requested.
2. Data Availability:
   a. Availability: All documents, which impact the Project, are available from the Owner.
   b. Contractor Responsibility: Full review of all Contract requirements is Contractor’s responsibility.

1.03 OWNER FURNISHED PRODUCTS

A. Owner Furnished Contractor Installed (OFCI)

1. Products furnished to the site and paid for by Owner. Installation and final connection is by Contractor.

2. Owner's Responsibilities:
    a. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor. Require vendor to indicate on shop drawings necessary blocking for attachment.
    b. Arrange and pay for product delivery to site.
    c. On delivery, inspect products jointly with Contractor.
    d. Submit claims for transportation damage. Replace damaged, defective or deficient items.
    e. Arrange for manufacturers' warranties, inspections and service.
3. Contractor's Responsibilities:
    a. Designate required submittal date for shop drawings, product data and samples.
    b. Designate required delivery date for each product.
    c. Review Owner-reviewed shop drawings, product data, and samples.
    d. Receive and unload products at site. Inspect products jointly with Owner.
    e. Handle, store and protect products from loss and damage.
    f. Coordinate installation and protect installed and finished products.
    g. Repair or replace items damaged after receipt.
    h. Remove packing debris from site.

1.04 CONTRACT DOCUMENTS

A. Contract Documents Language: Imperative language is intended. Except as otherwise indicated, written requirements are to be executed by the Contractor.

B. Related Provisions: The following applies to all Work specified and is to be provided to all Entities; whether directly or indirectly involved in the Work.
    1. Conditions of the Contract.
    2. Contract Drawings.
    3. Division 01 Specification Sections.
    4. As applicable to each Entity, the appropriate Specification Section(s) and related Specification Section(s) of other Installers.
    5. As applicable to each Entity, modifications to the Contract, if any.

1.05 QUALITY ASSURANCE

A. Standards of Quality: The highest quality of work is to be provided as necessary to comply with all of following.
    1. Contract requirements: unless in conflict with Code or other Authority requirements, then such requirements to take precedence, but conflicting requirements are to be resolved in accordance with Architect's directives.

2. Code or other applicable Authority requirements, e.g. codes, laws, and other mandates of Authorities having impact of law such as those of ADA.

3. Applicable Industry Standards, whether specified or not, and which are generally and currently accepted in the Industry as standard for grade of work indicated.

B. Completeness of the Work: It is the purpose of the Contract Documents to reasonably and professionally convey the quality, extent, and intent of the Work required so that the complete scope of Work can be interpreted there from. The industry does not require that the descriptions be neither highly detailed nor totally complete. It is the intent of the Contract Documents that the Work provided be complete. Provide the necessary work normally provided for the quality of work indicated to ensure that Work is complete.

C. Deviations from Contract Requirements:

1. General: Inform Architect of deviations from Contract requirements. Work with all entities that will be affected by such a deviation to assure that proper coordination can be accomplished, that new products, if any, which are anticipated to be incorporated can be properly interfaced with the work, are compatible with the interfacing work, and that such work conforms to the intent of the Contract Documents.

2. Directives from Authorities: Where Authorities direct a change in the work from that originally required by the Contract Documents, do not proceed with such work until securing the Architects consensus that such requirements are in conformance with the intent of the Contract Documents as originally reviewed with the Authorities.

D. Electronic Files:

1. Basis of Contract: Where electronic files are approved for use on Project, an original hardcopy set in possession of Architect to remain as standard basis of Contract. If Contractor desires, a Third Party may be assigned to hold a Contract representative hardcopy of the Contract Set involved; otherwise Architect's designated set to be representative Contract Set.

2. Verification: Prior to signing any agreements of Contract, Contractor to verify that work based on electronic files is consistent with original hardcopies.

3. Conflicts: If any, to be determined by the original hardcopies and not by any information derived from electronic files.

4. Use of Electronic Data as Basis of Contract: Data may be used, when hardcopies derived from electronic files are signed between Contracting Parties showing their recognition that such derived electronic information can be used in lieu of the designated document(s) in the base representative Contract Set.

1.06 REGULATIONS

A. General: Comply with all laws, ordinances, rules, and regulations, by any governmental authority, which in any manner apply to or affect those employed in the Work, the materials used in the Work, and the conduct of the Work. Contractor shall also comply with all such orders and decrees of bodies or tribunals having any jurisdiction or authority over the Work and which are or have the effect of law.

B. Americans with Disabilities Act (ADA):

1. Requirement: All person and entities providing work for this Project is required to be knowledgeable of the requirements of the American Disabilities Act as it affects their portion of the Work. Do not install work not in compliance with ADA.

2. Notification: Prior to any purchase of materials, fabrication, and installation of any work not complying with ADA requirements, notify Architect and secure design direction resolving non-complying features.

3. Design Intent: ADA dimensions indicated and required are either minimums or maximums and are to be adjusted for actual built tolerances so that required dimensions are not violated, e.g. sloping floors, etc. Comply with following.

   a. Finish to Finish Dimensions: Required dimensions are clearances from finished surfaces.

   b. “Minimum” Dimensions: The required dimension to be “not less than” that required from the required adjacent finished surface(s) to the ADA component.

   c. “Maximum” Dimensions. The required dimension to be “not greater than” that required from the required adjacent finished surface(s) to the ADA component.

4. Authority Directives:

   a. Notification: During the course of the Work, where Authorities may direct changes in the Work, Architect is to be notified prior to the purchase of any materials, prior to the fabrication of any materials, prior to use of any labor, and prior to execution of any work. Do not proceed with the work without the Architect’s approval.

   b. Intent: To avoid conflicts between prior Authority directives and those provided in the field.

1.07 OWNER’S RESTRICTIONS

A. Owner’s Operations: Work is to be scheduled around the Owner’s ongoing operations. Prior to the start of the Work, meet with Owner, and clearly define conditions under which the Work is to be performed relative to the Owner’s operations including, but not necessarily limited to, the following: regardless of what may be indicated in the Contract requirements prior to signing the Contract for the Work.

1. Times allowed for operations, including high noise generating operations.

2. Sequence, timing, and extent of areas to be made available to Contractor to complete the required work.

3. Limits placed on use of each work area.

4. Methods of moving material and equipment around, within, to and from staging and delivery areas to each work area.

5. Degree and duration in which equipment and materials may be left in place at locations in public areas.

6. Available parking.

7. Available services, such as for power and water.
8. Available facilities, such as restrooms.
9. Available staging areas.
10. Conditions under which Owner's available facilities and services are provided.
11. Limitations on generation of noise.
12. Security required.
13. Safety precautions and amount of protections required.
14. Degree of cleanliness and orderliness expected in Work areas.
15. Special activities of Owner occurring during course of Work and which could impact Work of this Contract.
16. Verification of any work to be done by Tenants in Owner leased spaces, if any, impacting Work of this Contract.
17. Verify salvageable work required by Owner.
18. Other Owner requirements.

B. Personnel Conduct:

1. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances within the on Owner's property is not permitted.
2. Radios: No radios are allowed on Project site.
3. CB Devices: May be used, but will be limited to Project use, be used primarily on Project Site or its immediate area, and not be on same wave.

C. Owner-Contractor Responsibility: In order to avoid any potential conflicts with the Owner and besides the initial pre-work verification of the Owner's intentions, the Contractor and Owner to set up an ongoing procedure to continuously liaison with each other to verify ongoing, anticipated, and potential future Owner operations that may have negative impacts on the Project and to arbitrate in advance of such impacts, methods to ensure that the Project is without any Owner-Contractor conflicts.

PART 2 - PRODUCTS – (Not Used)

PART 3 - EXECUTION

3.02 CONTRACTOR'S USE OF SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project. Nothing within these Contract Documents shall be interpreted as granting to the Contractor exclusive use and occupancy of the Project Site.

B. Work Hours: Unless otherwise defined by Contract, work hours to be as follows.

1. Typical Work Week: Monday through Friday, 7:00am to 6:00pm with Owner acceptable noise levels limited to hours between 9:00am to 5:00pm; no noise is allowed before 9:00am or after 5:00pm.
2. Night work: As approved by Owner, Environmental Assessment, Community Ordinances, special permits. If there is a conflict between any of the entities, comply with whichever is more stringent.
3. Weekend Work:
    a. Saturday: 7:00am to 6:00pm with Owner acceptable noise levels limited to hours between 10:00am to 5:00pm; no noise is allowed before 10:00am or after 5:00pm.
    b. Sunday: Not permitted.
4. Noise Levels, Definition:
    a. General: Comply with least noise-producing requirement as established by Owner and Authorities. Contractor to clearly verify and understand all noise level limitations established by Owner and Authorities and include such impact into his proposal; prior to signing Contact for the Work.
    b. On Owner's Property: Except where Authority requirements are more stringent, Owner to determine what are acceptable noise levels.
    c. Impact on Community: Secure State of Hawaii "Community Noise Permit." Comply strictly with State of Hawaii requirements.

C. Site security: The contractor shall be responsible for maintaining a secure site at all times. Any breaches of security, or unusual occurrences shall be immediately reported to the Owner's designated representative.

END OF SECTION

SECTION 01045 – CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes:

1. Cutting and patching work.

B. Related Sections:

1. Division 1 Sections, general.
2. Division 1 - Quality Control.

1.02 DEFINITION:

A. "Cutting and Patching": The phrase as used herein is defined as follows.

1. Cutting and patching includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surface to their original condition.
2. Cutting and patching is performed for coordination of the work, to uncover work for access or inspection, to obtain samples for testing, to permit alterations to be performed or for other similar purposes.
3. Cutting and patching performed during the manufacture of products, or during the initial fabrication, erection or installation processes is not considered to be "cutting and patching" under this definition. Drilling of holes to install fasteners and similar operations are also not considered to be "cutting and patching".
4. "Demolition" is recognized as related-but-separate category of work, which may or may not require cutting and patching as defined in this Section.

1.03 SUBMITTALS:

A. Methods: Notify Architect when any work is limited by requirements stated under "Quality Assurance" paragraphs. If requested, submit methods of cutting and patching for this Work. Do not begin Work, until successful review accomplished.

1.04 QUALITY ASSURANCE:

A. Structural Work: Do not cut and patch any work in a manner that would result in a reduction of its load-carrying capacity or of its load-deflection ratio.

B. Operational and Safety Limitations: Do not cut and patch operational elements or safety related components in a manner that would result in a reduction of their capacity to perform in the manner intended, including energy performance, or that would result in increased maintenance, or decreased operational life, or decreased safety.

C. Matching of Exposed-to-View Surfaces: Patching work should not be evident in final exposed-to-view work. Do not cut and patch work which is exposed-to-view in the finished Work and which cannot be restored to satisfactorily match the

surface in which the cutting and patching is done. Quality of match and final appearance of patched work to be determined by Architect.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General: Except as otherwise indicated or as directed by the Architect, use materials for patching that are identical to existing materials. If identical materials are not available, or cannot be used, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials for patching that will result in equal-or-better performance characteristics.

PART 3 - EXECUTION

3.01 INSPECTION:

A. Examination: Before cutting, examine the surfaces to be cut and patched and the conditions under which the work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the work.

3.02 PREPARATION:

A. Temporary Supports: When required, to prevent failure or unsafe conditions, provide temporary supports for work to be cut.

B. Protection: Protect other work during cutting and patching to prevent contamination and damage. Provide protection from adverse weather conditions for that part of the Project that may be exposed during cutting and patching operations.

3.03 PERFORMANCE:

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

5. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

a. Clean piping, conduit, and similar features before applying paint or other finishing materials.

b. Restore damaged pipe covering to its original condition.

3. Floors, Walls and Ceilings: Where walls or partitions that are removed extend one finished area into another, patch and repair floor, ceiling and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor, ceiling and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

3.04 CLEANING:

A. General: Thoroughly clean areas and spaces where work is performed or used as access to work. Remove contaminants from all surfaces without damaging finish of contaminated surfaces.

END OF SECTION

August 16, 2021

SECTION 01250 – CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Administrative and procedural requirements for handling and processing Contract modifications.

B. Related Documents and Sections:

1. General Conditions of Construction Contract
2. Section 01290 – PAYMENT PROCEDURES
3. Section 01320 – CONSTRUCTION PROGRESS DOCUMENTATION

1.02 DEFINITIONS

A. Entity: As used herein, to mean each legal entity under contract for the work indicated in the Change Order, whether directly or indirectly, including but not limited to, the Contractor and each Subcontractor, Supplier, Manufacturer, and Fabricator.

B. Primary Document: Document that integrates and summarizes primary information from related set or group of more detailed documents. A submittal may consist of a group or hierarchy of primary documents, with master (overall) Primary Document(s) from Contractor, which integrates and organizes all other organized information in a specific submittal document set. These documents may be any of the “submittal types” required herein; where such a document is used to integrate and summarize a more detailed set of documents.

C. Supporting Documents: Document(s) of significant detail as necessary to fully describe work or portions of work in Change Order; which is generally more detailed for specific information than what is in a related primary document.

1.03 SUBMITTALS

A. Work Changes Proposal and Contractor Initiated Proposal: For each proposal, submit to following.

1. Primary Document: From Contractor, submit, on a form acceptable to the Architect, proposal description with spreadsheets.
2. Supporting Documents: From each involved Entity, submit specific proposal descriptions with spreadsheets related to each Entity’s work.
3. Project Schedule: From Contractor, submit description of impact to Project Schedule, if any.

B. Payment for Approved Change Orders: For each completed change order, submit the following:

1. Primary Document: Submit as part of Contractor’s “Application for Payment”; on AIA forms G702 and G703 or forms acceptable to the Architect in accordance with Conditions of the Contract.

2. Supporting Documents: From Contractor, each Subcontractor, and each Supplier, submit following.
    a. Spreadsheets.
    b. Time Sheets.
    c. Invoices.

1.04 QUALITY ASSURANCE

A. General Submittal Format:
    1. Submittal Organization: Submit as follows.
        a. Sets: Integrate individual documents into sets.
        b. Identifications: In addition to other required identifications, each related Change Order document and each related document page to be printed with following.
            i. Change Order Number.
            ii. Page number.
            iii. Date.
        c. Change Order Number: Use Architect's approved number.
        d. Descriptions: Standardize information between different document type submittals to ensure that similar information is readily identified; or devise other methods for relating similar information. Simply identifying a RFI number shall be unacceptable as per the contract requirements all RFI's shall be accompanied with a no cost solution to provide the owner with a completed project,
    2. Document Types: Refer to "Definitions" paragraphs herein.
    3. Acceptance: Format and level of detail to be acceptable to Owner. Revise information, if requested, by Owner.

B. Specific Submittal Types: Comply with following when requested for specific submittals.
    1. General: Information to be detailed and itemized in clear and standard accounting format; acceptable to Owner's Representative and Architect.
    2. Spreadsheet: In addition to other required data, include direct costs, indirect costs, overhead, profit, and G.E.T. Direct costs to include labor, materials, equipment; relate to specific subcontracts, where applicable. Itemization to include measuring units used for costed item, associated quantities, production rates, man hours, and equipment hours.
    3. Time Sheets: Submit following from each entity, for all employees and equipment used for work under each approved Change Order.
        a. Primary Document: Document incorporating employee records and equipment records.
        b. Supporting Documents:
            i. Employee Payroll Records: Include employee names, dates when

work performed, and related tasks performed on specific dates; with accounting cost codes, and associated cost accounting.

ii. Equipment Records: Include equipment used, operator, dates of use, tasks performed on specific dates; with accounting cost codes, and associated cost accounting.

4. Invoices: From each entity, material invoices to be on letterhead, with invoice numbers, dates, itemized materials list descriptions, accounting cost codes and associated cost accounting. Invoiced work to show work specific to each Change Order.

C. Lien Waivers: Submit releases of each Entity, indicating that each work has been paid for. Releases for Change Order work should be specific to Change Order; not general to or include other work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1. Form for Minor Changes in the Work: AIA Document G710, "Architect's Supplemental Instructions."

2. If Contractor determines that an Architect's Supplemental Instruction involves adjustments to the Contract Sum or Contract Time, the Contractor shall provide written notice to the Architect within 7 calendar days of receipt of the instructions.

3.02 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time on AIA Document G709, “Work Changes Proposal Request”.

1. If necessary, the Architect along with the description will include supplemental or revised Drawings and Specifications identified with a Bulletin number and date in the revision block on the drawing or the upper right corner of the revised specifications. (Example: Bulletin #1 – 01/01/2019).

a. The revisions on the Drawings will be clouded with a corresponding delta and number near the cloud.

b. The revisions in the Specifications will be reflected as follows:

i. Revised text will be in bold/italicized text.

ii. Added text will be in bold text

iii. Deleted text with have a strike-through

2. Work Change Proposal Requests issued by are not instructions either to stop work in progress or to execute the proposed change.

3. Within time specified in Work Changes Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    a. Maintain detailed itemized records of work performed on a time and materials basis, including labor, materials, equipment and miscellaneous costs. Provide complete information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.
    b. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    c. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    d. Include costs of labor and supervision directly attributable to the change.
    e. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    f. Proposal Form: Use Contractors own form acceptable to the Architect.

B. Contractor-Initiated Change Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect. Notify Owner within 48 hours of identifying the condition that initiates a change request. The Owner will not approve any additional compensation to the contractor or schedule adjustments for changed conditions where the contractor proceeds without prior written authorization.
    1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
    2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    4. Include costs of labor and supervision directly attributable to the change.
    5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    6. Comply with requirements in Section 01630 – PRODUCT OPTIONS AND SUBSTITUTIONS if the proposed change requires substitution of one product or system for product or system specified.
    7. Proposal Request Form: Use Contractors own form acceptable to the Architect.

C. Approval or Rejection of Proposals

1. When initiated by the Owner or Architect through a Work Changes Proposal Request:
    a. Contractor to submit a detailed proposal in writing. Quotation will be guaranteed for period specified in Work Changes Proposal Request beginning from signing of proposal. If no period is specified, guarantee quotation for sixty (60) days from signing.
    b. Owner reviews proposal and responds in writing in one of the following ways:
        i. Request for additional information.
        ii. Approve proposal to be incorporated into a Change Order.
        iii. Rejecting the Proposal.
    c. Contractor upon receiving approval of proposal is authorized to proceed with the Work.
    d. If additional information is requested by Owner, respond in writing within fifteen (15) calendar days of Owner's request
2. When initiated by the Contractor:
    a. Contractor to submit a detailed change proposal in writing.
    b. Owner reviews proposal and responds in writing in one of the following ways:
        i. Agrees with Contractor's cost proposal.
        ii. Request for additional information.
        iii. Rejecting the proposal.
    c. If the Owner responds by agreeing to the Contractor's change proposal, a Change Order will be processed.
    d. If additional information is requested by Owner, respond in writing within fifteen (15) calendar days of Owner's request.

3.03 CONSTRUCTION CHANGE DIRECTIVE (CCD)

A. Construction Change Directive: Architect will issue on AIA Document G714 signed by Owner instructing Contractor to proceed with a change in the Work, prior to an agreement on adjustment in the contract sum and/or contract time, for subsequent inclusion in a Change Order.
    1. Construction Change Directive shall contain a complete description of change in the Work. It shall also designate the method to be followed to determine change in the Contract Sum or the Contract Time.
        a. If necessary, the Architect along with the description will include supplemental or revised Drawings and Specifications identified with a CCD number and date in the revision block on the drawing or the upper right corner of the revised specifications. (Example: CCD-1 – 1/01/2019).
            i. The revisions on the Drawings will be clouded with a corresponding delta and number near the cloud.
            ii. The revisions in the Specifications will be reflected as follows:

a.) Revised text will be in bold/italicized text.

b.) Added text will be in bold text.

c.) Deleted text with have a strike-through.

2. Upon receipt of the signed Construction Change Directive, the Contractor shall proceed with the change in the Work as directed.
   a. If the Contractor agrees with the proposed method of adjusting the Contract Sum and/or Time this method shall be used to determine the future applications for payment.
   b. If the Contractor disagrees with the proposed method of adjusting the Contract Sum and/or Time, the Contractor must still perform the changes in the Work and the Architect shall determine the method and the amount of adjustment on the basis of reasonable expenditures and allowance for overhead and profit.
3. By signing the Construction Change Directive, the Contractor indicates their agreement with the document including the adjustment in the Contract Sum and/or Time or the method for determine them. This agreement shall then be recorded as a Change Order.
4. Documentation: Contractor shall maintain detailed records on a time and material basis of work required by the Construction Change Directive.
   a. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

3.04 CHANGE ORDER

A. Change Order: Upon Owner's approval of Work Changes Proposal or Contractor initiated change proposals or Contractor's agreement to a Construction Change Directive the Architect will issue a Change Order for signatures of the Owner and Contractor on AIA Document G701.
   1. The Owner may choose to approve (in writing) multiple change proposals to be combined in a single Change Order

B. Contractor's Responsibility: Upon receiving Change Order, comply with following.
   1. Promptly revise Progress Schedule to reflect any changes in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
   2. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item. Adjust Contract Sum as shown on Change Order.

END OF SECTION

SECTION 01290 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Document and Sections:

1. General Conditions of Construction Contract
2. Section 01250 - CONTRACT MODIFICATION PROCEDURES
3. Section 01320 – CONSTRUCTION PROGRESS DOCUMENTATION
4. Section 01770 – CONTRACT CLOSEOUT

1.02 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's Construction Schedule.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
   a. Contractor’s Construction Schedule
   b. Application for Payment forms with continuation sheets.
   c. Submittal schedule.
   d. Items required to be indicated as separate activities in Contractor's construction schedule.
2. Submit the schedule of values to Owners Representative at earliest possible date, but no later than seven (7) days before the date scheduled for submittal of initial Applications for Payment.
3. Sub-schedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values coordinated with each phase of payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one-line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:
   a. Project name and location.
   b. Name of Architect.
   c. Architect's project number.
   d. Contractor's name and address.
   e. Date of submittal.

2. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
   a. Related Specification Section or Division.
   b. Description of the Work.
   c. Design Professional related to scope of Work
   d. Schedule of Value.
   e. Change Orders (numbers) that affect value.
   f. Revised Schedule of Value
   g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
   a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
   a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
8. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.03 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Owner's Representative and paid for by Owner.
   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Application for Payment Forms: Use AIA Document G702 or forms acceptable to Owner's Representative and Owner for Applications for Payment. Submit forms for approval with initial submittal of schedule of values.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Owner's Representative will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.

2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.

3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.

2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.

3. Provide summary documentation for stored materials indicating the following:

a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.

b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.

c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Owner's Representative by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit each Application for Payment with the Contractor's waiver of mechanics lien for the period of construction covered by the application.
5. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
6. Waiver Forms: Submit executed waivers of lien on forms, acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Products list (preliminary if not final).
5. Schedule of unit prices.
6. Submittal schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Report of preconstruction conference.
13. Certificates of insurance and insurance policies.
14. Performance and payment bonds.
15. Data needed to acquire Owner's insurance.

I. Application for Payment at Substantial Completion: After Owner's Representative issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Completion of items specified for completion after Substantial Completion.
3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
4. Updated final statement, accounting for final changes to the Contract Sum.
5. Transmittal of required Project construction records to the Owner.
6. Removal of temporary facilities and services.
7. Removal of surplus materials, rubbish, and similar elements.
8. Written documentation from the Contractor that all punch list items have been completed.
9. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
10. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
11. Evidence that claims have been settled.
12. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Requests for Information (RFIs).
3. Project meetings.

B. Related Sections:

1. Division 1 Sections, general.
2. Section 01010 - SUMMARY OF WORK.
3. Section 01290 – PAYMENT PROCEDURES
4. Section 01320 – CONSTRUCTION PROGRESS DOCUMENTATION
5. Section 01330 - SUBMITTAL PROCEDURES

1.02 SUBMITTALS

A. Primary Subcontractor List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in field office and by each temporary telephone. Keep list current at all times.

1.03 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of

the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.04 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Misuse of the RFI Process:

1. Intent: RFI’s are not to be used in an adverse and frivolous manner, e.g., as a method of enlisting the Architect’s services for finding information already indicated in the Contract Documents, as a means for forwarding non-legitimate claims for increases Contract Amount or Contract Schedule that is already intended by Contract, etc.

C. Contractor Initiation: RFI’s must be submitted through the General Contractor.

D. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

E. RFI Forms: Form shall be provided by the Architect.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

F. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow 10 working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:
    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.

3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01250 - CONTRACT MODIFICATION PROCEDURES.

   a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use software log acceptable to the Architect with not less than the following:

1. Project name.

2. Name and address of Contractor.

3. Name and address of Architect,

4. RFI number including RFIs that were returned without action or withdrawn.

5. RFI description.

6. Date the RFI was submitted.

7. Date Architect's response was received.

H. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within 7 days if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.05 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.

2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner’s Representative and Architect, within 3 days of the meeting.

B. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    a. Contract Documents.
    b. Options.
    c. Related RFIs.
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. Sustainable design requirements.
    i. Review of mockups.
    j. Possible conflicts.
    k. Compatibility requirements.
    l. Time schedules.
    m. Weather limitations.
    n. Manufacturer's written instructions.
    o. Warranty requirements.
    p. Compatibility of materials.
    q. Acceptability of substrates.
    r. Space and access limitations.
    s. Regulations of authorities having jurisdiction.
    t. Testing and inspecting requirements.
    u. Installation procedures.
    v. Coordination with other work.
    w. Required performance results.
    x. Protection of adjacent work.
    y. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.

5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

C. Progress Meetings (OAC Meetings): Conduct progress meetings at regular intervals to occur once a week.

1. Coordinate dates of meetings with preparation of payment requests.

2. Attendees: In addition to representatives of Owner, Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.

2) Sequence of operations.

3) Status of submittals.

4) Status of sustainable design documentation.

5) Deliveries.

6) Off-site fabrication.

7) Access.

8) Site utilization.

9) Temporary facilities and controls.

10) Progress cleaning.

11) Quality and work standards.

12) Status of correction of deficient items.

13) Field observations.

14) Status of RFIs.

15) Status of proposal requests.

16) Pending changes.

17) Status of Change Orders.

18) Pending claims and disputes.

19) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

   a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Submittals Schedule.
2. Contractor's Construction Schedule.
3. Daily construction reports
4. Material location reports.
5. Field condition reports.
6. Construction Photographs.

B. Related Sections include the following:

1. Section 01290 - PAYMENT PROCEDURES for submitting the Schedule of Values.
2. Section 01310 - PROJECT MANAGEMENT AND COORDINATION for submitting and distributing meeting and conference minutes.
3. Section 01330 - SUBMITTAL PROCEDURES for administrative and procedural requirements for submittals.
4. Section 01450 - QUALITY CONTROL for submitting a schedule of tests and inspections.
5. Section 01770 - CLOSEOUT PROCEDURES for submitting "As-Built Schedule" as Project Record Documents at Project closeout.

1.03 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of the Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Float: The measure of leeway in starting and completing an activity.

1.04 SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and Owner/Commissioning Authorities, and other information specified.

B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit to Architect and Owner an electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

C. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.

2. Specification Section number and title.

3. Submittal category (action or informational).

4. Name of subcontractor.

5. Description of the Work covered.

6. Scheduled date for Architect's final release or approval.

D. Field Condition Reports: Submit 2 copies of report to architect and 1 copy of report to the Owner at time of discovery of differing conditions.

E. Construction Photographs: To be reviewed at each project meeting and to be submitted in a binder and on an electronic disk with close-out documents.

1.05 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of the Owner's request.

B. Pre-scheduling Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.

2. Verify availability of qualified personnel needed to develop and update schedule.

3. Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.

4. Review delivery dates for Owner-furnished products.

5. Review Allowances and time required for procurement and installation.

6. Review schedule for work of Owner's separate contracts.
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for completion and startup procedures.
10. Review and finalize list of construction activities to be included in schedule.
11. Review submittal requirements and procedures.
12. Review procedures for updating schedule.

1.06 COORDINATION

A. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.01 SUBMITTALS SCHEDULE

A. Preparation: Submit to the Architect and Owner a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.
    a. Submittal schedule to be incorporated directly into Contractor’s Construction Schedule.
    b. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal Category: Action; informational.

d. Name of subcontractor.

e. Description of the Work covered.

f. Scheduled date for Architect's and Construction Manager's final release or approval.

g. Scheduled dates for purchasing.

h. Scheduled date of fabrication.

i. Scheduled dates for installation.

j. Activity or event number.

2.02 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion to date of Final Completion.

1. Contract completion date can be changed, at the Owner's discretion, by submission of a schedule that shows an early completion date, as allowed by the General Conditions to the Contract.

C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than fifteen days, unless specifically allowed by Architect and Owner.

2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

a. Structural components, plumbing, heating/cooling/ventilation equipment.

3. Submittal Review Time: Include review and resubmittal times indicated in Section 01330 - SUBMITTAL PROCEDURES in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.

4. Startup and Testing Time: Include not less than seven days for startup and testing.

5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.

2. Allowances: Include a separate activity for each allowance item detailing when information is required from Architect, and when the Work for the allowance must begin so as not to affect the completion date.

3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.

4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 01010 - SUMMARY OF WORK. Delivery dates indicated stipulate the earliest possible delivery date.
5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01010 - SUMMARY OF WORK. Delivery dates indicated stipulate the earliest possible delivery date.
6. Work Restrictions: Show the effect of the following items on the schedule:
    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.

E. Milestones: Include Milestones indicated in the contract documents in schedule, including, but not limited to the following:

1. Notice to Proceed
2. In wall inspections by floor
3. Overhead inspection by floor
4. Insulation inspections by floor
5. Pre-installation conferences for each conference in specs
6. Building Structure Complete
7. Building dry-in
8. Roof Complete
9. Drywall start
10. Window/glazing installation start
11. Window/glazing installation complete
12. Exterior Envelope Mockup complete
13. Unit mockup start
14. Unit mockup complete
15. Mechanical equipment start up
16. Conditioned air available
17. Elevators operational
18. Site available for landscape
19. Fire Alarm Certification
20. Commissioning Start

21. Fire and life Safety Inspection
22. Contractor Punch list complete
23. Owner Punch list start
24. Substantial Completion
25. Final Completion

F. Resource / staffing: If the Contractor falls materially behind on any portion of the work, the Owner reserves the right to receive a resource loaded schedule indicating required staffing levels for each activity. Show aggregate manpower requirements on a daily or weekly basis.

G. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

1. Refer to Division 1 Section "Payment Procedures" for cost reporting and payment procedures.

H. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis to demonstrate the effect of the proposed change on the overall project schedule.

I. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

2.03 CONTRACTORS CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, cost and resource loaded, time-scaled CPM network analysis program.

1. Submit schedule to the Architect and Owner in the time frame stipulated in the General Conditions to the Contract.
2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meetings and payment request dates.
3. Use "one workday" as the unit of time. Include a list of non-working days and holidays incorporated into the schedule.
4. Failure to include any work item required for the performance of this schedule shall not excuse the Contractor from completing all work within the applicable completion dates, regardless of Architect or Owner approval of the schedule.

B. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable official paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities.
   a. Preparation and processing of submittals.
   b. Mobilization and demobilization.

c. Purchase of materials.

d. Delivery.

e. Fabrication.

f. Utility Interruptions.

1) Power outages or any utility shut downs must be given advance notice of 30 days and must be included in the CPM schedule.

g. Installation.

h. Architect and Owner Inspections.

i. Work by Owner that may affect or be affected by Contractor's activities.

j. Testing and commissioning.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Schedule start and completion dates shall be consistent with Contract milestone dates.

3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.

4. Format: Mark the critical path: Locate the critical path near center of Network; locate paths with most float near the edges.

C. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare Tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.

2. Description of activity.

3. Principal events of activity.

4. Immediate preceding and succeeding activities.

5. Early and late start dates.

6. Early and late finish dates.

7. Activity duration in workdays.

8. Total float or slack time.

9. Average size of workforce.

D. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.

2. Changes in early and late start dates.

3. Changes in early and late finish dates.

4. Changes in activity durations in workdays.

5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in cost-loading or resource-loading.
8. Changes in the Contract Time.

2.04 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain.
7. Testing and inspection.
8. Accidents.
9. Meetings and significant decisions.
10. Unusual events.
11. Stoppages, delays, shortages, and losses.
12. Meter readings and similar recordings.
13. Emergency procedures.
14. Orders and requests of authorities having jurisdiction.
15. Change Orders received and implemented.
16. Construction Change Directives received and implemented.
17. Services connected and disconnected.
18. Equipment or system tests and startups.
19. Partial completions and occupancies.
20. Substantial Completions authorized.

B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.

3. Material stored following previous report and remaining in storage.

C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information. Include a detailed description of the differing conditions and photographs illustrating the existing conditions, together with recommendations for changing the Contract Documents.

D. Construction Photographs: Photographs to document pre-existing conditions and to regularly document construction progress.

PART 3 - EXECUTION

3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.

1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.

2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

B. Float: Float is a shared resource, available to both parties as needed. The Contractor shall not sequester shared float through such strategies as (a) extending activity duration estimates to consume available float, (b) using preferential logic, or (c) using extensive crew / resource sequencing, constraints, unnecessary milestones, leads or lags on logic ties, and hammock type activities. Since Float within the Construction Schedule is jointly owned, no time extensions will be granted nor delay damages paid until a delay occurs which extends the work beyond the contract completion date. Since float within the Construction Schedule is jointly owned,it is acknowledged that Trustees-caused delays on the project may be offset by Trustees-caused time savings (i.e., critical path submittals returned in less time than allowed by the contract, approval of substitution requests and credit changes which result in a savings of time to the Contractor, etc.). In such an event, the Contractor shall not be entitled to receive a time extension or delay damages until all Trustee-caused time savings are exceeded and the contract completion date is also exceeded.

C. Contractor's Construction Schedule Updating: At two-week intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.

2. As the Work progresses, indicate Actual Completion percentage for each activity.

D. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.

2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Owner to receive both paper and working electronic copy of each update.

3. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

3.02 CONSTRUCTION PHOTOGRAPHS

A. Photographic Process: Digital Imaging.

B. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.

C. Preconstruction Digital Photographs and Digital Video Recording: Before starting construction, take color photographs and digital video recording of Project site and affected City right-of-ways and surrounding properties and interior existing photos of affected areas from different vantage points. Show existing conditions adjacent to property.

D. Periodic Construction Photographs: Periodic digital color photographs and digital file to be submitted in duplicate on disc and in print form at each pay request with the following views:

1. Exterior views of all distinct elevations on a weekly basis. Photographs of each elevation are to be taken from the same location throughout the project.

2. Interior views of all levels of major spaces on a monthly basis. Of particular interest is the process of structure, mechanical (ductwork, equipment, plumbing, and sprinkler systems), electrical, partitions and interior finishes.

3. Roof: Views of all roof areas on a weekly basis during periods when work is occurring on or adjacent to the roof.

4. Field Office Prints: Retain one set of prints of periodic photographs in field office at Project site, available at all times for reference. Identify photographs the same as for those submitted to Architect.

END OF SECTION

SECTION 01330 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Administrative and procedural requirements for submittals.
2. Administrative submittals.
3. Work related submittals.

B. Related Sections:

1. Division 1 Sections, General.
2. Section 01320 – CONTRUCTION PROGRESS DOCUMENTATION for submittal schedule requirements
3. As required in Conditions of Contract and Specification Sections.

1.02 DEFINITIONS

A. Work Related Submittals: Are defined as submittals which are product specific, which are required for the evaluation, fabrication, and incorporation of the product into the Work, and which are commonly known as “product data”, “shop drawings”, “samples”, and “mockups”.

B. Miscellaneous Submittals: Are defined as submittals which ensure the quality of the Work after the termination of the Contract and are also submittals of additional products required by the Contract but not required for installation. These submittals include, but are not necessarily limited to, the following.

1. Contractor’s Project warranty.
2. Contractor’s specific warranties.
3. Installers’ warrantees.
4. Manufacturer’s standard and required warranties.
5. Operating and Maintenance Manuals.
6. Owner’s extra stock.
7. Maintenance tools and spare parts.

C. Submission Time: The indicated time for any submissions is not to mean “the last day when such submissions are to be mailed out”, but shall mean “the last day such submissions are to be received” by the addressee and that such submissions are due no later than 12 noon of the due date, unless otherwise acceptable to the Architect.

1.03 SUBMITTALS, GENERAL

A. Requirements: Refer to the Conditions of the Contract and all respective specification sections for complete submittal requirements. Electronic Submittals

preferred, except finish materials-samples shall be hardcopy. Where finish is as specified request electronic submittal first as most will not require hardcopy.

B. Number of Submittals Required:

1. Electronic: Adobe PDF file, unlocked and compressed to be less than 10 MB total file size. Architect to establish File Transfer Protocol (FTP) site and instructions for uploading and response.

2. To the greatest extent possibly make submittal in electronics format indicated above. If submittals cannot be made electronically comply with the following:

    a. Hardcopy: Submit six (6) sets where not otherwise indicated and additional sets as the Contractor requires for his Work.

C. Requirements for Each Submittal Set: Each set to consist of the following.

1. Letter of Transmittal: Include following minimum information.

    a. Contractor's Submittal Number.

    b. Architect's Project name and Project number.

    c. Contractor's name, address, phone number, and Project number.

    d. Date of Issue.

    e. Names of Transmitter and to whom submittal transmitted to.

    f. Names of Subcontractor, Manufacturer, and Supplier.

    g. Purpose of transmittal.

    h. Distribution record.

    i. Specification Section related to.

    j. Complete list of enclosures, including number of pages for each listed enclosure, descriptions, number of each enclosure transmitted, and dates of enclosures.

    k. Contractor's unequivocal certification stating that the information complies with the requirements of the Specific Project Contract Documents. No variation of language is acceptable.

    l. Signature of Transmitter in script and print.

2. Enclosures: Complete submittal enclosures with each enclosure identified as follows.

    a. Identify each sheet/page with Architect's Project number, submittal date as indicated on transmittal, and submittal number.

    b. Staple submittals together wherever possible, except where review would be hindered by bound copies. Do not submit loose sets. Temporarily bind each set for transmittal.

3. Letter of Transmittal/ Contractors Stamp: shall not include

    a. Statements in any form relieving, diminishing and/or transferring Contractors requirements to the project scope and contract requirements.

    b. Requirements for Architect and/or its consultant to provide more than a summary confirmation review for basic scope requirements.

c. Submittal items that are not per project scope shall be submitted prior per the substitution request process.

4. Preference for Electronic Submittals/Shop Drawings:

   a. Architect prefers where possible electronic submittals. Process shall include the establishment of a project File transfer Protocol site that will be used for the transfer of submittals. Due to the size and complexity of submittals emails hall not be used for submission.

   b. Finish and/or product color samples shall not be submitted via electronic submittal unless previously approved.

   c. Electronic submittals shall be composed into one Adobe PDF file with CSI section number and explanation, such as: ***08800-01-glazing.pdf***.

5. Packaging: No matter what form of packaging each submittal is distributed in, e.g. envelope, box, crate, etc., each such packaging shall be properly identified with each addressee's company's name, address, and to whom specifically the package should be received by.

1.04 WORK RELATED SUBMITTALS

A. General Requirement: Submit comprehensive and Project specific data.

B. Product Data: When submission required by individual sections, in addition to other required data, submit all manufacturer's published information of required products including, but not limited to, general data, specifications, installation instructions, testing information, standard drawings and cut sheets, and color charts. Highlight mark all Project related data, when printed data on any page is not specific to Project required products. Write and draw *in* applicable information as indicated by printed or pictorial information when required to properly indicate compliance with requirements of Contract Documents.

   1. Submit Product Data in the following format:

      a. PDF electronic file.

C. Shop Drawings: When submission required by individual sections in addition to other required data, submit technical drawings with Project specific information of level and detail necessary to properly fabricate and erect work in accordance with Contract requirements, including proper coordination with other related work. Unless otherwise indicated, comply with following.

   1. Identification on Each Sheet: Include not less than following.

      a. Architect's name and Architect's Project number.

      b. Contractor's name.

      c. Subcontractor's name.

      d. Supplier's name.

      e. Manufacturer name.

      f. Detailer's Initial.

      g. Date of Issue.

      h. Space for revision date/description.

2. Referencing Details: Identify details by reference to sheet and detail numbers shown on Contract Documents. Where details shown are not on Contract Documents, they should be referenced to larger sections which can be clearly identified with work on Contract Documents.
3. Dimensions: Distinguish field dimensions from those of the Contract Documents.
4. Minimum Sheet Size for Drawings: 18” x 24”.
5. Drawing Types: Unless otherwise indicated, Drawings to include plans, elevations, sections, and details of the Work. Show with related work.
6. Scale of Drawings: Provide a scale of a size not less than scale used on similar drawings on Contract Documents.
7. Submit Shop Drawings in the following format:
    a. PDF electronic file.

D. Samples: When submission is required by individual sections, submit actual physical samples of the Work. Where not otherwise indicated, and required, comply with following.

1. Identical to Work: Samples to be identical, including for finish, as products required for the Work.
2. Flat/Thin or Sheet Type Samples: Approximately 8-1/2” x 11” x thickness of material, or as otherwise acceptable to Architect.
3. Running Samples: Profile by not less than 11-1/2” length.
4. Color/Pattern Selection Process:
    a. Process: Initial accurate (photo-like accuracy) color/pattern (not texture) charts may be submitted, followed by Architect selections from chart, followed by another submittal of actual samples of selections, followed by Architect’s final selections, followed by final submittal of actual final samples.
    b. Inaccurate Color Charts: Where color charts are submitted and Architect determines from comparison of actual samples that charts are not accurate enough in his estimation, the Architect reserves the right to request a single set of actual samples for each inaccurate chart of the full range of colors and patterns available; which shall be provided with no additional cost to the Owner.
5. Texture: Submit the actual sample.
6. Variation of Color/Texture: Where color and texture varies, provide not less than 5 samples indicating the full range of color/texture variation.

E. Quality Control Submittals:

1. Items listed in specification sections under “Quality Control Submittals” Paragraph.
2. Number of copies: Same number indicated in “Product Data” Paragraph above.
3. Design data for Architect and Owner’s Agent knowledge, as Contract Administrator for Owner. Information for limited purpose of assessing

conformance with information given and design concept expressed in Contract Documents.

4. Test reports for Architect's and Owner's Agent knowledge, as Contract Administrator for Owner. Information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.
5. Certificates:
    a. By manufacturer, installation/application subcontractor, or Contractor in quantities specified by Product Data.
    b. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
    c. Certificates may be recent or previous rest results on material or Product,, but must be acceptable to Architect.
    d. From manufacturers for each product indicating materials supplied or installed are asbestos free.
6. Manufacturers instructions for Architect's and Owner's Agents knowledge, as Contract Administrator for Owner.
    a. Printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Architect/Engineer and Owner's Agent for delivery in quantities specified for Product Data.
    b. Indicate special procedures, perimeter conditions requiring special attention and special environmental criteria required for application or installation.
7. Manufacturer's field reports for Architect and Owner's Agent benefit, as Contract Administrator for Owner.
    a. Submit report in duplicate within 30 days of observation for information.
    b. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

F. Mockups: Except as otherwise specified, comply with following.

1. General: Not less than 4' x 8' minimum, constructed as independent samples (not part of Work); unless otherwise specified or acceptable to Architect.
2. Supporting Structure: For independent mockups, provide an appropriate supporting structure, e.g. wood framing and plywood, that is capable of being moved without damage to mockup and that provides a suitable base for the attachment of the required mocked up materials.

1.05 MISCELLANEOUS SUBMITTALS

A. General: Types as specified herein and referred to elsewhere in Contract Documents.

B. Owner's Extra Stock and Maintenance Tools and Spare Parts:

1. Packaging: Package in heavy-duty boxes in sizes that are capable of being hand carried by two persons maximum. Heavy and easily damaged materials, e.g. tile and stone, are to be placed in wooden crates or containers. Materials that are easily damaged, such as tile, stone, etc. are to be packaged with polystyrene spacers or other materials to protect it from breakage.
2. Contents: Each package to contain one material type; unless otherwise acceptable to Architect.
3. Labeling: Fully label each package. Laser printed or similar quality readable printed labels to indicate product name, other descriptive product information, manufacturer name/address, and supplier name/address.

1.06 QUALITY ASSURANCE

A. Coordination: In addition to other factors impacting timing of submissions sent to Architect, submittals are required to be successfully reviewed by Architect, prior to any purchase and fabrication of required Project products, unless otherwise acceptable to Architect.

B. Identified Project Data: Submittals to be clearly identified for all Project specific requirements. Materials not properly identified may be returned for resubmittal.

C. Responsibility: Where submittals are required to be signed, provide signatures of those who can legally bind the legal entity to the certifications or other requirements made in the submittals. Signatures to be scripted, typed, and include typed title of person, unless otherwise acceptable to Architect. Provide notarization when required or requested by Architect. It is up to the legal entity to assure that submittals provided by them have been signed by responsible persons; it is not the responsibility of the Architect to verify the signatures and therefore acceptance by the Architect of any signature submittals is not recognition by the Architect that such signatures are appropriate.

D. Contractor's Review: Contractor is to fully review submittals prior to submission to Architect. Where review is not accomplished, even when stamped with review stamp, as evidenced by obvious data not marked for noncompliance, such submittals will be rejected.

E. Architect's Review:

1. Contractor's Responsibility: From time to time, the Architect may include review information that is the Contractor's responsibility. Such review information is provided solely to assist the Contractor as part of the review process. The Architect makes no claim to the accuracy of information provided and makes no claim to the Contractor's responsibility as defined by the Conditions of the Contract. The Contractor is solely responsible for all construction means, methods, techniques, sequences and procedures, and therefore shall be responsible for determining the accuracy of such information provided by the Architect and for its use in the Work.
2. Review of Component vs. Complete Assembly: Architect's review of single component of a larger assembly does not constitute his approval of the entire assembly, unless otherwise indicated.

PART 2 - PRODUCTS

2.01 AVAILABLE PRODUCTS

A. Intent: For each required Project product, unless specifically indicated, it is intended that the full range of characteristics, e.g. components, materials, colors, patterns, textures, finishes, be made available that is standard for the indicated quality of product required; for selection by the Architect and provided at no additional cost to the Owner for the Project.

B. Submittals: Submit features to be selected by Architect.

PART 3 - EXECUTION

3.01 CONTRACTOR'S RESPONSIBILITIES – GENERAL

A. Routing:

1. General: Submit all required submittals to Architect, unless otherwise indicated.
    a. Electronic submittals submit via E-mail and for large submittals submit via project FTP site.
2. Owner's Extra Stock and Maintenance Tools and Spare Parts: Deliver to Owner's designated onsite locations.

B. Substantiating Data: Submit substantiating data as requested by the Architect.

C. Prior to Review: Verify field measurements and construction constraints.

D. Review: Review all submittals prior to submission to Architect, including for coordination with field requirements. Indicate review by action stamp and signature.

E. Deviations: Indicate significant deviations from Contract Requirements.

F. Not to be Used for Work: Do not allow use of any submittal for fabrication and installation of Work for which successful review by Architect has not been completed as evidenced by Architect's signature action mark.

G. Completeness and Piecemeal Submittals: Do not submit submittals that are not complete.

H. Time of Submission:

1. General: Submit submittals as soon as possible. Times for submission indicated herein are absolute minimums and Architect, Owner, and Consultant cannot guarantee that review can be accomplished within times indicated as their times are not strictly dedicated to this Project and have no control over the types and sizes of the submittals which also affect review time.
2. The Contractor is solely responsible for properly sequencing submittals for proper work progress. However, Architect and Owner shall with reasonable promptness review all submissions required for their review and return them to the Contractor so as not to impede the progress of the Work.

3.02 CONTRACTOR'S RESPONSIBILITIES - WORK RELATED SUBMITTALS

A. Time of Submission: Submit not less than ten (10) working days before dates reviewed submittals will be needed; fifteen (15) working days where Architect's Consultant required to review submittal. Review period shall commence on the Architect's receipt of the submittal.

B. Returned for Incorporation: Pay for costs to return samples, mockups, and any other items to Contractor that may be required for Architect's review and are indicated for incorporation into the Work, if successfully reviewed by Architect.

3.03 CONTRACTOR'S RESPONSIBILITIES - MISCELLANEOUS SUBMITTALS

A. Miscellaneous Submittals: As required in the respective Specification Sections.

B. Other Required Submittals: As required by the Contract Documents or as otherwise required by the schedule of the Work.

3.04 ARCHITECT'S RESPONSIBILITIES

A. Review: Review Contractor's submission with reasonable promptness. Indicate review by action mark. Return to Contractor.

B. Review For:

1. Completed of submittal.
2. Review Contractor's review comments and marks for impact on design concept review.
3. Review of compliance with design concept.

3.05 DISTRIBUTION FOR SUCCESSFULLY REVIEWED SUBMITTALS

A. Shop Drawings and Product Data: Distribute successfully reviewed shop drawings and product data as follows.

1. Contactor's file.
2. Job site file.
3. Record document's file.
4. Subcontractor.
5. Supplier.
6. Fabricator.

B. Samples: Job site file and as otherwise directed by the Architect.

C. Mockups: Retain mockups at job site in protected storage areas for duration of Contract Period and protect from damage. Except for model rooms, remove and dispose of mockups in legal manner at' end of Contract Period. Before removing from site, verify with Architect whether such mockups are required to be retained for a longer period.

3.06 REQUIREMENTS FOR UNSUCCESSFUL REVIEW & RESUBMISSION

A. Format: Resubmit number. Indicate on letter of transmittal that submittal is a "RESUBMISSION" and indicate reference to previous submittal by number and date.

B. Product Data and Samples: Resubmit with all required enclosures and either or both substantiating and additional data/samples as requested by the Architect.

C. Shop Drawings: Resubmit revised Shop Drawings which are properly clouded, identified, and dated.

D. Mockups: Adjust as directed by Architect, until successful review by Architect is achieved.

END OF SECTION

August 16, 2021

SECTION 01420 - REFERENCES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Use of Standards.
2. Abbreviation/Acronym use and format.
3. Definitions.

B. Related Sections:

1. Division 1 Sections.
2. Divisions 2 – 16

1.02 STANDARDS

A. Requirement: Each type of work provided for this Project is required to comply with recognized Industry standards (also may be referred to as “references”) that are applicable to the class of work intended by the Contract Documents. Compliance is required whether such standards are indicated or not and whether such standards are in published form or an unwritten but accepted practice in the Industry for the class of work.

B. Use:

1. General: Where a specific standard is indicated, this is to be interpreted as a method for conveying the design intent and its use expands on or clarifies the requirements and its use is not intended to limit or to negate the specific Industry standards intended to apply to the class of work to be provided.
2. Conflict: Where several Industry standards apply to the Work, and where quality requirements of these applicable standards conflict for the class of work required, it is intended that the standard producing the higher quality work is to apply.

1.03 ABBREVIATIONS/ACRONYMS:

A. General: Abbreviations and acronyms are used throughout the Contract Documents. If any abbreviation or acronym is not understood, these should be verified from the Architect.

B. Industry Acronyms: Generally, but not necessarily, these are abbreviations or acronyms of Industry organizations, e.g. ASTM, AWI, WIC, NRCA, SMACNA, etc.

C. Architect Created Acronyms: Where used in Contract Documents the following format is used.

1. Format: Abbreviation of one or several letters, followed by a hyphen, followed by an identification number, e.g. WD-1 for wood type number one or WPM-1 for waterproof membrane type one.

2. Number Sequence and Related Sections: Designations may be used between related specification sections where primary product is similar and therefore numbers are not necessarily sequential within a specific specification section, although the numbering will be sequential between all related sections where similar designations are used.

1.04 DEFINITIONS

A. Related Sections: The listed specification sections under the “Related Sections” paragraphs indicate some of the primary related work which is impacted by the work of the specific specification section in which the list appears. It is not intended as a complete list (which in many cases would otherwise be-enormous) but has been provided to assist the Contractor.

B. Exposure Definitions: Unless otherwise indicated, the following definitions are to apply.

1. Exterior Surfaces: Exposed on the outside envelope of structure or surfaces of other constructed elements and equipment which are exposed to the “outside air”. Covered or protected areas “open to the (outside) air” and not fully enclosed by walls, floors, roofs, windows, and doors, are to be considered as part of the exterior and surfaces occurring in such spaces are to be considered exterior surfaces.

2. Interior Surfaces: Surfaces interior to the fully enclosed envelope of a structure or within the fully enclosed envelope of other constructed elements and equipment. These surfaces are not exposed to the “outside air”.

3. Exposed: Surfaces which are exposed to view from any vantage point, which are not concealed from view due to permanent non-accessible construction or earth, and which is not defined as semi-exposed.

4. Semi-Exposed: Surfaces not readily visible but are accessible and viewable from selected vantage points. These surfaces include those hidden by and hidden on removable or openable doors, panels, and drawers, and surfaces of undersides of shelves, counters, desks, and toe spaces, surfaces which are hidden by moveable equipment/furnishings, and other similar surfaces.

5. Concealed: Surfaces not exposed to view from any vantage point and which is concealed by permanent non-accessible construction, earth, and equipment/furnishings. Such concealed surfaces include those surfaces permanently concealed within inaccessible wall cavities, above inaccessible ceilings, within inaccessible floor construction, within inaccessible shafts, and those buried underground in earth. Include within this definition, surfaces above otherwise semi-exposed accessible suspended acoustical ceilings and the interior portions (except ferrous metal components) of the elevator shaft which are to be considered as concealed spaces.

C. Type: Word is defined to mean any characteristic(s) which makes a product different or unique from another product; including differences which could occur when it is the same product, e.g. products of nature such as those made from wood or stone. Characteristics include, but are not limited to, those of size,

shape, profile, finish, texture, color, pattern, chemical/material composition, material performances, etc.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01450 – QUALITY CONTROL

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Quality control inspection/testing requirements.

B. Related Sections:

1. Division 1 Sections.

1.02 SUBMITTALS

A. From Testing Service:

1. Testing Service Qualifications: Submit qualifications as required herein under “Quality Assurance” paragraphs.
2. Test Reports: Laboratory to submit not less than six (6) copies of test reports to Architect. Include all information necessary to evaluate test, including following:
    a. Date issued.
    b. Architect’s Project Title and Number.
    c. Testing Laboratory Name, Address, and Phone Number.
    d. Inspector’s name and signature.
    e. Date of each inspection and sampling.
    f. Record of temperature and weather at time of each inspection and sampling.
    g. Date of each test.
    h. Identification of material/product tested with Specification Section.
    i. Location of material/product and location of inspection or where samples taken.
    j. Types of tests conducted.
    k. Results of tests.
    l. Evaluation and recommendations based on results of testing and inspections, including evaluation with respect to compliance with Contract requirements

B. Testing Schedule: Submit schedule indicating when work is scheduled to be ready for types of testing required. Update schedule if changes occur and resubmit promptly to Architect to assure that inspections/testing can be accomplished when work is ready for testing.

C. Mock Ups: Provide listing of all specified mock ups and their proposed schedule for review.

D. Control Unit(s): Confirmation of control unit locations and elements to be constructed within.

1.03 QUALITY ASSURANCE

A. Testing Service Qualifications:

1. Meet “Recommended Requirements for Independent Laboratory Qualification”, latest edition, published by American Council of Independent Laboratories.

2. Meet basic requirements of ASTM E 329, “Standard of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction”.

3. Inspection Report: Submit copies of inspection report of facilities made by Materials Reference Laboratory of National Bureau of Standards during most recent tour of inspection; with memorandum of remedies of any deficiencies reported by inspection.

4. Testing Equipment:

a. Calibration: Calibrate at 12-month intervals maximum by devices of accuracy traceable to either the National Bureau of Standards or accepted values of natural physical constraints.

b. Certificate of Calibration: Submit certificate of calibration made by accredited calibration agency.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 INSPECTIONS/TESTING, GENERAL

A. General: Comply with requirements of the General Conditions of the Contract and requirements specified herein. Use of any testing service shall in no way relieve Contractor of his obligation to perform the Work in accordance with the Contract.

B. Testing/Inspection Agency: Where Contractor is responsible for securing services of independent Testing/Inspection Agency, such Agency to be acceptable to Owner.

C. Testing Owner Requires: Owner reserves right to test any and all work. If testing is desired by Owner, Contractor shall cooperate and provide appropriate access to site. Where date/timing is critical to testing requirements (as determined by Testing Agency), Contractor shall not deny appropriate access to test site by the Owner and at the Owner specified date/times, for any reason. Where date/timing is not as critical to test requirements, Owner will cooperate with Contractor to extent reasonably possible.

D. Protection and Repair: Protect work exposed by or for testing service. Upon completion of inspection, testing, and sampling, repair damaged work and restore finishes to match the adjacent finishes.

E. Contract Conforming Work:

1. Resulting from Code Required Testing/Inspection:

a. Owner's Responsibilities: Pay for testing and inspections by an independent Testing/Inspection Service for tests and inspections required by Special Inspections.

b. Contractor's Responsibilities: Comply with following:

1) Except for Special Inspections, pay for and secure testing and inspections from independent Testing/Inspection Service for all other testing and inspections required by Authorities and Code.

2) At no cost to Owner, Contractor to provide for costs and work required to patch any damaged work; regardless of who pays for Testing/Inspection Service.

2. Resulting from Owner Required Testing/Inspection:

a. Owner's Responsibilities: Owner to pay for costs of Testing/Inspection Services and costs to patch any damaged work.

b. Contractors Responsibilities: Patch any damaged work.

F. Nonconforming Work:

1. Resulting from Code Required Testing/Inspection:

a. Owner's Responsibilities: Pay for initial costs for tests and inspections by an independent Testing/Inspection Service for tests and inspections required by Special Inspections.

b. Contractor's Responsibilities: Comply with following.

1) Except for testing and inspections required by Special Inspections, pay for all other initial testing and inspections.

2) Correct defective work to meet Contract requirements.

3) Pay for all subsequent testing/inspection costs, until compliance with Contract requirements is achieved as evidenced by results of testing/inspections.

2. Resulting from Owner Required Testing/Inspection:

a. Owner's Responsibilities: None.

b. Contractor's Responsibilities:

1) Initial Costs: Pay for initial testing/inspection costs and other fair costs, if any, incurred by the Owner and Architect which directly resulted from the testing/inspection requirements of the nonconforming work.

2) Correction of Work: Correct defective work to meet Contract requirements. Pay for all subsequent testing/inspection costs, until compliance with Contract requirements is achieved as evidenced by results of testing/inspections.

3) Time Impact to Work: Requests for additional time will generally not be considered when resulting from installation of defective work.

3.02 MOCKUPS

A. Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
    a. Allow five days for initial review and each re-review of each mockup.
    b. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed Work.
5. Demolish and remove mockups when directed, unless otherwise indicated.
6. When indicated in these Specifications, some mock-ups may become part of the work provided that they meet the requirements set forth in their respective specification sections and are approved by the Architect.

3.03 LABORATORY DUTIES:

A. Cooperation: Cooperate with Architect. Ensure that personnel are at the site at the required times for inspections and testing.

B. Personnel: Provide qualified personnel of appropriate experience and training necessary to carry out specific assigned duties.

C. Performance of Service: Perform required inspections, sampling, and testing of materials and methods of construction. Ascertain compliance with requirements of Contract Documents as measured by standards required by specifications, by authorities, and by recognized ASTM and other acceptable industry standards.

D. Notifications: Promptly notify Architect of irregularities or deficiencies of the inspected or tested Work.

E. Test Reports Submittal: Execute inspections, sampling, and testing in prompt manner and submit test reports at times as prearranged with Architect.

F. Additional Services: Perform as required by Architect.

G. Limitations of Authority: Testing Service is not authorized to do the following.

1. Release, revoke, alter, or enlarge on, requirements of Contract Documents.

2. Approve or accept any part of the Work.

3. Perform any duties of the Contractor.

4. Interfere in any way with the construction process, except as otherwise approved for performance of services contracted for.

3.04 CONTRACTOR'S RESPONSIBILITIES

A. Contractor Notifications: Notify the Architect not less than five (5) working days prior to when work is ready for inspection/testing to allow for assignment of personnel and scheduling of testing service.

B. Cooperation: Cooperate with testing service personnel. Provide appropriate access to work where inspections, sampling, and testing required. Furnish casual labor as necessary to provide access to work to be tested, to assist in obtaining and handling of samples at the site, and to otherwise facilitate the inspection and testing process.

C. Contractor Arranged Tests: Contractor may arrange and pay for additional inspections, sampling, and testing from Owner's testing service when arranged through Architect.

D. Non-complying Work: Where non-complying work is evidenced by a Testing Service, the Contractor at his option shall do one of following.

1. Further Testing:

a. Testing Service and Methods of Testing: Secure and pay for further testing of non-complying work by another qualified testing service satisfactory to the Owner. Employ same test methods as testing service indicating noncompliance. Other test methods may be employed only when approved by Owner after review of alternate test proposals and justifications and only when previous test methods utilized can be shown to be inappropriate.

b. Results of Testing: Where results of testing indicates noncompliance, comply with requirements of paragraph 3.04 D.2., "Corrective Measures" as indicated. Where results indicate compliance, work with Architect in resolving problem expeditiously.

2. Corrective Measures:

a. Owner's Costs Directly Attributable to Inspection/Testing Process: Pay for Owner's costs, including costs of all tests conducted, and other fair costs incurred by the Owner and the Architect.

b. Correction of Work: Provide all work necessary to correct defective work to comply with Contract requirements.

END OF SECTION

SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

A. Requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

B. Temporary utilities include but are not limited to, the following:

1. Sanitary facilities, including toilets, wash facilities, and drinking water facilities.
2. Lighting.

C. Support facilities include, but are not limited to, the following:

1. Storage and fabrication sheds
2. Trash, refuse disposal.
3. Construction aids and miscellaneous service and facilities

D. Security and protection facilities and measures include, but are not limited to, the following:

1. Environmental protection.
2. Tree and plant protection.
3. Barricades, warning signs, and lights.

E. Related Sections: Refer to Divisions 2 through 16 for other temporary requirements including ventilation, humidity requirements and products in those Sections.

1.02 USE CHARGES

A. General: Cost or use charges for temporary facilities are not chargeable to the Owner and shall be included in the Contract Price. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:

1. Other Contractors with agreements with the State working within the contract limits.
2. Occupants of Project.
3. Testing agencies.
4. Owner’s Representative and personnel of authorities having jurisdiction.

B. Water Service: Use water from Owner’s facilities existing water system without metering and without payment of use charges**.**

C. Electric Power Service: Use electric power from Owner’s existing system without metering and without payment of use charges.

D. Sewer Service: Use sewer service from Owner’s existing system without metering and without payment of use charges.

E. Waste Receptacle Bins: Do not use facility's waste receptacle bins

1.03 SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Temporary Utility Reports: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

D. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.

1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.

2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.

3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

E. Landfill Disposal Receipts: Submit copies of receipts issued by a landfill facility. Include receipts with Contractor Daily Progress Report and part of the Construction Waste Management Plan.

1.04 QUALITY ASSURANCE

A. Standards: Comply with IBC Chapter 33, "Safeguards During Construction", ANSI A10.6, NECA's "Temporary Electrical Facilities", and NFPA 241, "Construction, Alteration, and Demolition Operations".

1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.

2. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70, "National Electrical Code".

a. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.05 PROJECT CONDITIONS

A. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:

1. Keep temporary services and facilities clean and neat.

2. Relocate temporary services and facilities as required by progress of the Work.

1.06 PREPARATION AND PROTECTION

A. Protection of Property: Continually maintain adequate protection of the Work from damage and protect all property, including but not limited to buildings, equipment, furniture, grounds, vegetation, material, utility systems located at and adjoining the job site. Repair, replace or pay the expense to repair damages resulting from Contractor's fault or negligence.

B. Before starting work to be applied to previously erected constructions, make a thorough and complete investigation of the recipient surfaces and determine their suitability to receive required additional construction and finishes. Make any repair that is required to properly prepare surfaces, and coordinate the Work to provide a suitable surface to receive following Work.

C. Commencing work by any trade implies acceptance of existing conditions and surfaces as satisfactory for the application of subsequent work, and full responsibility for finished results and assumption of warranty obligations under the Contract.

D. Protect existing (including interiors) work to prevent damage by vandals or the elements. Provide temporary protection. Use curtains, barricades, or other appropriate methods. Take positive measures to prevent breakage of glass and damage to plastic, aluminum and other finishes.

E. Repairs and Replacements: Promptly replace and repair damages to the approval of the Owner's Representative. Additional time required to secure replacements and to make repairs does not justify a time extension.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended.

2.02 TEMPORARY FACILITIES

A. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

B. Barriers and Enclosures:

1. Barricades: Provide and maintain barriers and warning signs as required to prevent public entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations. Barricades shall made of plywood and painted per Owners color scheme and apply signage and/or graphics as directed/provided by Owner.

2. Provide temporary partitions and ceilings as required to separate work areas from Owner occupied areas, to prevent penetration of dust and moisture into Owner occupied areas, to prevent damage to existing areas and equipment.

3. Pedestrian Walkways: Pedestrian walkways adjacent to fence to be protected when required by Authorities.

4. Safety Signage: Provide signage as required for the safety and notification of the Public.

5. Removal: Remove from site when no longer necessary and when acceptable to Architect.

2.03 EQUIPMENT

A. Self Contained Combination Toilet and Urinal Units: Single occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material. One quarter of, or at least one unit(s) shall contain a handwash sink with potable water storage.

B. Electrical Outlets: Properly configured, NEMA polarized outlets to prevent insertion of 110 to 120 V plugs into higher voltage outlets; equipped with ground fault circuit interrupters, reset button, and pilot light.

C. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125 V ac, 20 A rating, and lighting circuits may be nonmetallic sheathed cable.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary services.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Storm and Sewer Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If storm drains are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. If neither sewers nor drainage

facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off site in a lawful manner.

1. Filter out excessive soil, construction debris, chemicals, oils, and similar contaminants that might clog sewers, storm drains or pollute waterways before discharge.
2. Connect temporary sewers, if used as directed by sewer department officials.
3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. After heavy use, restore normal conditions promptly.
4. Provide temporary filter beds, settlement tanks, separators, and similar devices to purify effluent to levels acceptable to authorities having jurisdiction.

C. Water Service for Construction Site: Water Service: A temporary tap into the facility's existing water system is allowed, subject to the following conditions:

1. Comply with the Department of Health's and County water provider's requirements when tapping into the existing water system.
2. Reasonable amounts of water will be available without charge.
3. Should the Contractor at any time fail to comply with any or all of the above conditions, the Owner may terminate the use of water. The Contractor shall remove the hookup within 48 hours of notification of such termination.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.

1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
2. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel who handle materials that require wash up. Dispose of drainage properly. Supply cleaning compounds appropriate for each type of material handled.
3. Locate toilets and drinking water fixtures so personnel need not walk more than 2 stories vertically or 200-feet horizontally to facilities.

E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

F. Electric Power Service: Use of Owners facilities electrical power services will be permitted as long as equipment is maintained in a condition acceptable to the

Owner and so long as the power demand does not exceed existing system capabilities or interfere with the facilities operations.

G. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment. Protect wiring, in conduits or other, measures when exposed to possible damage or traffic areas.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.

I. Telephone Service: Provide a portable wireless telephone with voice-mail or messaging service for superintendent's use in making and receiving telephone calls when at the construction site.

3.03 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Locate Storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access or where shown on Contract Drawings or as directed by the Owners Representative.

2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion.

B. Temporary Sign(s):

1. Provide and install temporary signs as listed. Sign designs are attached to Part 3 of this Section:

a. Warning Sign

2. Install signs where directed by the Owner's Representative or where indicated to inform public and persons seeking entrance to the Project. Do not permit installation of unauthorized signs.

3. Provide temporary signs to provide directional information to constructional personnel and visitors.

4. Construct signs with durable materials, properly supported or mounted, and visible.

C. Trash, Refuse Disposal: Coordinate the disposal of trash and refuse with the requirements of Section 01595 – PROJECT CLEANING.

1. Department of Health – Illegal Dumping Notice. See attachment to Part 3 of this section.

a. This Notice to be printed out on 8.5x11" paper.

b. This Notice to be posted at the job site field office and/or in locations visible to all contractors, subcontractors, suppliers, vendors, etc. throughout the duration of the project.

2. Illegal Dumping of solid waste could subject the Contractor to fines and could lead to felony prosecution in accordance with Chapter 342H, HRS. For more information, see the following web site:
http://www.hawaii.gov/health/environmental/waste/sw/pdf/Illdump.pdf

3. Provide waste collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste.

4. Do not burn debris or waste materials on the project site.

5. Do not bury debris or waste material on the project site unless specifically allowed elsewhere in these specifications as backfill material.

6. Haul unusable debris and waste material to an appropriate off site dump area.

   a. Water down debris and waste materials during loading operations or provide other measures to prevent dust or other airborne contaminants.

   b. Vacuum, wet mop, or damp sweep when cleaning rubbish and fines which can become airborne from floors or other paved areas. Do not dry sweep.

   c. Use enclosed chutes or containers to conveying debris from above the ground floor level.

7. Clean up shall include the collection of all waste paper and wrapping materials, cans, bottles, construction waste materials and other objectionable materials, and removal as required. Frequency of clean up shall coincide with rubbish producing events.

D. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.

1. Do not load elevators beyond their rated weight capacity.

2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.

E. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

3.04 ENVIRONMENTAL CONTROLS

A. General: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Dust Control:

1. Prevent dust from becoming airborne at all times including non working hours, weekends and holidays in conformance with the State Department of Health, Administrative Rules, Title 11, Chapter 60.1 Air Pollution Control.

2. Contractor is responsible for and shall determine the method of dust control. Subject to the Contractor's choice, the use of water or environmentally friendly chemicals may be used over surfaces that create airborne dust.

3. Contractor is responsible for all damage claims due to their negligence to control dust.

C. Noise Control

1. Keep noise within acceptable levels at all times in conformance with the State Department of Health, Administrative Rules, Title 11, Chapter 46 Community Noise Control. Obtain and pay for the Community Noise Permit when construction equipment or other devices emit noise at levels exceeding the allowable limits.

2. Ensure mufflers and other devises are provided on equipment, internal combustion engines and compressors to reduce loud disruptive noise levels and maintain equipment to reduce noise to acceptable levels.

3. Unless specified elsewhere, do not start construction equipment that meet allowable noise limits prior to 6:45 A.M. or equipment exceeding allowable noise levels prior to 7:00 A.M.

D. Odor Control

1. Implement odor control and elimination measures prior to and during the application of the roofing, waterproofing and painting materials. Control/elimination measures shall be field tested at off-hours and consists of the following measures:

a. Sealing of air intakes with activated carbon filters. Install filters in accordance with requirements and recommendations of the filter manufacturer. Seal filters at joints and against building exterior walls to prevent leakage of unfiltered air where required due to size of intake opening. Provide track system to secure filters.

b. Protection of Contractor personnel and occupants of the structure and surrounding buildings as necessary to comply with requirements of OSHA, NIOSH and/or governing local authority.

2. When disposing of all refuse or unused materials, observe all EPA, OSHA or local disposal requirements.

3.05 BARRICADES AND ENCLOSURES

A. Barricades: Provide complete construction fencing with dust screening around the building site. Contractor will be responsible in maintaining the fence and gates and will be required to remove the fencing around the site prior to turnover.

1. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner's Representative with 2 sets of keys.
2. Maintain temporary construction barricade(s) throughout the duration of the Work, assume frequent repairs due to strong wind exposure. During the course of the project, the Owner's Representative may require additional barricades be provided for the safety of the public. Contractor shall erect the additional barricade(s) at its own expense.

B. Temporary Enclosures:

1. Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
2. Where cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

C. Opening Protection

1. Vertical Openings: Close openings with plywood or similar materials.
2. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load bearing, wood framed construction.

3.06 TEMPORARY FIRE PROTECTION

A. Store combustible materials in containers in fire safe locations.

B. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire exposure areas.

C. Supervise welding operations, combustion type temporary heating units, and similar sources of fire ignition.

D. Develop and supervise an overall fire prevention and first aid fire protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.07 OPERATION, TERMINATION, AND REMOVAL

A. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by heat and similar elements.

B. Termination and Removal: Remove each temporary facility when need for its service has ended, or when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the property of Contractor. The Department reserves the right to take possession of Project identification signs.

3.08 ATTACHMENTS

A. Department of Health – Illegal Dumping Notice

END OF SECTION

August 16, 2021

DEPARTMENT OF HEALTH
ILLEGAL DUMPING NOTICE

The law requires you to dispose solid waste only at recycling or disposal facilities permitted by the Department of Health.

"Solid waste" includes municipal refuse, construction and demolition waste, household waste, tires, car batteries, derelict vehicles, green wastes, furniture, and appliances.

Illegal dumping of solid waste
or allowing illegal disposal of solid waste on your property even if contractual or other arrangements are made could subject you to fines from $10,000 to $25,000 per occurrence and could lead to felony prosecution
in accordance with Chapter 342H, HRS.

Contact the Department of Health,
Solid Waste Section at 586-4226
to report illegal dumping activities
or if you have further questions.

SECTION 01595 – PROJECT CLEANING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Cleaning during construction.
2. Final Project cleaning.

B. Related Sections:

1. Division 1 Sections, general.
2. Section 01500 - CONSTRUCTION FACILITIES & TEMPORARY CONTROLS.
3. Section 01770 – CLOSEOUT PROCEDURES.
4. Divisions 2 through 16 Sections.

1.02 DEFINITION

A. Clean: Unless otherwise acceptable to the Architect, a surface shall be deemed clean when the following conditions have been met at time of inspection.

1. Dust and debris removed.
2. No evidence of damage, mars, stains, or contaminants on surface.
3. Finish is in accordance with Contract requirements.

1.03 SUBMITTALS

A. Quality Assurance Submittals: Refer to “Quality Assurance” paragraphs herein.

1.04 QUALITY ASSURANCE

A. Cleaning Program: Submit a cleaning program to be submitted to all Entities that are to deliver and install work on Project Site. Indicate general and Entity specific requirements. Program to include, but not be limited to, following.

1. Extent of cleanup.
2. Frequency of cleanup.
3. Responsibilities for removal of waste materials from Site.
4. Methods for use and removal of hazardous materials.
5. Precautions for use of materials and methods which can damage Project materials.
6. Location of trash dumpsters for general use.
7. Owner specific requirements.

B. Off Site Areas:

1. General: Generally keep off Site areas, e.g., Owner's off Site areas, and adjacent Public and private property, free from debris and other waste materials which are generated by Contractor's operations.
2. Owner's Property: Immediate perimeter areas to be cleaned daily. Areas along paths where vehicles have dropped or tracked in mud, dirt, and other materials to be cleaned on regular basis, including washing of streets and other public access ways.

C. Damages:

1. Project: Cleaning methods and materials which damage-installed products are to be rectified to satisfaction of Architect. When acceptable to Architect, minor damages may be restored where evidence of restoration is not evident and where restoration does not affect long term performance and aesthetics of product; otherwise replace damaged materials with Contract complying new materials.
2. Off Site: Replace or restore damaged materials to satisfaction of affected parties.

D. Special Requirement - Glass: Glass scratched by sharp cleaning implements, e.g. razor blades, etc., is to be considered as damage to glass products. Generally, scratched glass products are to be replaced with new Contract complying materials. Buffing out of such scratches will generally not be allowed, except for only very minor areas and only when acceptable to Architect.

PART 2 - PRODUCTS

2.01 CLEANING MATERIALS

A. General: Use only cleaning materials recommended by the Manufacturer of the product to be cleaned. Use cleaning materials only on surfaces recommended by Cleaning Material Manufacturer. Do not use any cleaning material, including acid products for cleaning purposes where surface finish, color, and texture can be altered.

PART 3 - EXECUTION

3.01 CLEANING REQUIREMENTS, GENERAL

A. Project Conditions: Maintain Project in orderly and clean manner at all times. Protect Project from exposure to any hazardous and unsafe conditions. Comply with requirements of the authorities and insurance.

B. Use of Cleaning Materials: Comply in strict accordance with Cleaning Material Manufacturers instructions. Provide adequate ventilation when necessary, including during use of volatile or noxious materials. Store unused materials in proper containers. Store toxic and volatile products in secure location and in manner to prevent any unsafe conditions.

C. Methods of Cleaning: Utilize cleaning methods which are recognized by the industry as appropriate for surfaces to be cleaned. Utilize least destructive methods to accomplish appropriate cleaning. Where methods may be destructive to material, to its finish, color, or texture, secure approval from Architect. Where

cleaning materials are used, comply in strict accordance with Cleaning Material Manufacturer's requirement.

D. Personnel: Personnel to be skilled and experienced for each type of cleaning required.

E. Trash, Refuse Disposal: Comply with requirements specified in Section 01500 - CONSTRUCTION FACILITIES & TEMPORARY CONTROLS.

3.02 DURING CONSTRUCTION

A. General:

1. Loose Waste: Execute cleaning in an orderly and systematic manner to ensure that building, grounds, and adjacent public properties are maintained free from accumulations of waste materials and rubbish generated by the ongoing construction process.

2. Deleterious Products on Work: Maintain cleanliness of installed work, whenever required, to ensure that substrates are not permanently marred or stained and to prevent deleterious products from damaging or deteriorating the installed work.

B. Regular Cleanup: At reasonable intervals or when necessary, institute cleaning process.

C. Collection Containers: Provide collection containers as required for proper disposal of waste resulting from their ongoing work. Owner's trash dumpsters are not to be used.

D. Dust Producing Materials:

1. General: Prevent excessive dust pollution and contamination of adjacent finishes.

2. Site Soil Borne Dust: wet down dry dust. Conduct operations to prevent hazards and damages by watering procedures. Where watering procedures are not appropriate, provide temporary enclosure of operation.

E. Dropping/Throwing: Do not drop or throw materials any distance which would create a hazard or cause dust pollution. Provide appropriate chutes, including enclosures when required.

3.03 AT TIME OF SUBSTANTIAL COMPLETION INSPECTION

A. Work to be Inspected: All Work to be inspected to have been fully cleaned by time of inspection. Cleaning to be scheduled so that surfaces can be inspected in clean condition.

B. Restorations: Any Work to be inspected which had been damaged, marred, or contaminated, to have been fully restored to Contract requirements at time of inspection.

C. Concealed Spaces: Remove dust and debris from concealed spaces which are accessible.

D. Contractor's Equipment/Materials: Remove all evidence of Contractors equipment/materials and other Work, except that which is necessary for completion of unfinished Work, if any.

3.04 AT TIME OF FINAL INSPECTION

A. General: Comply with same procedures stated for “Substantial Completion Inspection”, except for Work certified by Architect and which remained unaffected by the Contractor’s ongoing operations in other areas.

END OF SECTION

SECTION 01600 – PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. General requirements for products.

B. Related Sections:

1. Section 01630 – PRODUCT OPTIONS AND SUBSTITUTIONS.

1.02 DEFINITIONS

A. Manufacturer: Where not otherwise indicated within a specifications section, reference to the “manufacturer” shall refer to the primary product manufacturer of that section.

1.03 SYSTEM DESCRIPTION

A. Performance: Each product provided shall perform to the Contract requirements under the anticipated conditions of use and installation. Performance evaluation of any product to include the performance of the product by itself and its performance relative to the total assembly for which it is a part.

1.04 SUBMITTALS:

A. General: Refer to Division 1 requirements and individual specification sections.

B. List of Products:

1. Format: Prepare a typewritten list of the principal products in a form acceptable to the Architect. For each product, provide and organize information in columns for each of the following headings.
    a. Related unit-of-work specification section number.
    b. Generic name as used in contract documents or where not indicated as commonly accepted.
    c. Proprietary name and product designation number.
    d. Manufacturer’s name, address, phone number, Project assigned representative.
    e. Supplier’s name, address, phone number, company representative for Project.
    f. Installer’s name, address, phone number, primary trade of workmen, and Project assigned representative.
    g. Projected delivery date and time span of delivery period.
2. Initial Submittal: Submit within 30 calendar days from date of commencement of the Work. Submit a list of those products that must be established early in the Contract Period. The complete list may also be submitted at the Contractor’s option.

3. Completed List: Submit within 45 calendar days from date of commencement of the Work.
4. Qualifications to List: For each list submitted, provide typewritten explanations of omissions of data and explanations of why any products deviate from Contract requirements.
5. Architect's Review/Action: Review list within 10 working days. For each item, indicate one of following written responses.
    a. "No Reasonable Objection": Indicates that products may be incorporated into the Work subject to compliance with Contract requirements.
    b. "Objection": Indicates that products may not be incorporated into the Work. Architect to provide qualifying explanation for rejection.
    c. "Deferred Action": Indicates that products require further data for proper evaluation by Architect. Contractor shall secure data as required and submit this to the Architect. Architect to act on "deferred action" items in timely manner.
6. Coordination: Incorporate delivery date and time span of delivery data for products in progress schedules. Refer to Section 01310 – PROJECT MANAGEMENT AND COORDINATION.

1.05 QUALITY ASSURANCE

A. Product Appearance:
    1. Intent: Appearance of products for any work exposed to view in final finished work is critical to Design intent of Architect.
    2. Requirement: Secure written verification of finishes, e.g. colors, patterns, textures, matching, etc., before any purchase, fabrication, and installation of any such products.

B. Manufacturer, Supplier, Fabricator, Installer Experience: Except as otherwise indicated or acceptable to the Architect, any entity furnishing, installing, or furnishing/installing products shall not have less than three (3) years minimum current experience with the required products and services being provided. Such services and products shall have also been provided for not less than three (3) current successful projects of similar scope.

C. Product Source Control: Maintain the original products furnished for this Project throughout the Contract Period. Do not change to other generically similar products, unless otherwise acceptable to the Architect.

D. Stored Products: Assume full responsibility for protection and safekeeping of products stored on and off premises during Contract Period. Maintain insurance as required for full replacement value of all products as stored and in locations stored.

E. Deviations from Contract Requirements: Refer to Section 01010 - SUMMARY OF WORK.

F. Fire Rated Assemblies: Where fire rated assemblies are indicated, provide composite assemblies that strictly conform to each Product Manufacturer's laboratory tested assemblies that conform to the Contract requirements, are in

compliance with the applicable codes, and are acceptable to the Authorities.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Available Manufacturers: Comparable products of other Manufacturers may be incorporated into the Work when such products comply with the following.

1. Are acceptable to the Architect.
2. Contract requirements do not specifically indicate “no substitution”, or “provide one of the following only”, or other similar language to this effect.

2.02 PRODUCTS, GENERAL

A. Compliance with Requirements: All products provided for this Project to comply with Contract requirements.

B. Assembly of Products: Each interfacing product in an assembly shall be verified for its Project appropriateness relative to its use and appropriateness-to-any interfacing product in the assembly. Do not provide products which do not comply with this requirement and are not acceptable to the Manufacturer’s of the interfacing products.

C. Dimensional Coordination: Where dimensional tolerances indicated on Contract Drawings differ from products to be provided, notify Architect of such differences

D. Environmental Requirements: Maintain types of environmental conditions required for each product as recommended by the Product Manufacturer for the specific Project conditions.

2.03 SPECIAL PRODUCT REQUIREMENT:

A. Galvanizing of Ferrous Products:

1. Intent: Provide hot dipped galvanized ferrous products wherever any one of the following conditions exist:
    a. Where product is exposed on an “exterior surface”.
    b. Where product is exposed or in contact with moisture retaining or transmitting substrates, e.g. exterior facing (includes interior face of) concrete and masonry structures, slabs on grade, roof insulation, roof concrete deck fill, etc.
    c. Where product is within and located anywhere within same enclosure or room where water is contained, where high humidity is present, or where enclosure will be subjected to water spray. These enclosures include, but are not necessarily limited to, the restrooms. Include products within cavities above “lay-in acoustical suspended ceilings”.
2. Galvanizing: Provide hot dipped galvanized coatings complying with ASTM A 123 or ASTM A 153 as applicable to the product, or as otherwise acceptable to the Architect.

PART 3 - EXECUTION

3.01 DELIVERY, STORAGE, & HANDLING

A. General: Comply with each Product Manufacturer's Project specific requirements.

B. Delivery: Deliver products in original containers with seals unbroken and labels intact. Inspect products for damage upon arrival at site. Reseal and mark to indicate inspected material. Replace damaged materials in timely manner as not to jeopardize the Project schedule.

C. Storage and Handling: Store and handle materials to prevent damage and deterioration. Secure from unauthorized access.

D. Loading of Structure: Do not load any structure in any manner that can endanger the structure.

3.02 EXAMINATION

A. Verification of Conditions: Prior to installation, verify the actual existing Project conditions under which the Work will be installed. Inform the Architect in writing of any detrimental conditions. Do not begin the Work where the detrimental conditions have not been brought into satisfactory conformance. Start of the Work indicates that the existing conditions are acceptable to ensure a successful installation.

3.03 INSTALLATION

A. Installation, General: Comply with the Manufacturer's Project specific requirements. Do not provide any installations that would produce a quality less than indicated by the Contract requirements without acceptance by the Architect.

B. Completeness of Assemblies: Refer to Section 01010 - SUMMARY OF WORK.

C. Structural Stability and Compatibility of Assemblies: Each Installer and the Contractor to review their work for structural stability and compatibility relative to the work of other Installers. Notify Architect of any concerns in writing.

D. Tolerances: Install Work plumb, level and true to line; without warp or wrack. Installed Work to conform to Industry acceptable tolerances for quality of Work required, except as otherwise indicated.

E. Color, Pattern, Texture Variation:

1. General: For each product, where any one of the following characteristics of color, pattern, and texture can vary for similar natural products or similarly finished products, install materials in each area to assure a uniform visual appearance acceptable to the Architect.
2. Examples: Such products include, but are not limited to, certain stone materials, tile, concrete, masonry, carpet, and wall covering.
3. Methods to Ensure Uniformity: Methods of ensuring uniformity may include utilizing materials in sequence as manufactured from same lots where singular lot may be used for single contiguous area or may require the hand selection of materials between several lots.

4. Directional Pattern: When not otherwise indicated, for materials with specific directional pattern/texture orient such pattern/texture as directed by Architect.

F. Protection: It is the intent of the Contract Documents that the Work be clean, without contamination, without abnormal deterioration, without damage, and properly functioning at the time of acceptance by the Owner. Generally, conduct operations in strict conformance with each Manufacturer's recommendations and instructions applicable to the Project specific conditions and as otherwise necessary to accomplish the proper protection of the Work from all harmful causes.

G. Defective Work: Replace defective work. Restoration may be accomplished when satisfactory to the Architect. Such work shall be done at no cost to Owner.

END OF SECTION

August 16, 2021

SECTION 01630 – PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Requirements for substitution proposals.
2. Requirements for “value engineering” proposals.

B. Related Sections:

1. Division 1 Sections, general.
2. Section 01600 – PRODUCT REQUIREMENTS.

1.02 DEFINITIONS

A. Substitution Proposal: A proposal offered by the Contractor of a product(s) to be used in lieu of the specified product(s); which is generically similar to the specified product(s). Value Engineering proposals shall not be considered as part of the substitution review process, it is a separate process lead by the Owner and where appropriate the Architect and its designers may be asked to provide an opinion.

B. Products: Use of words such as “products”, “materials”, “assemblies” “systems”, are to be used interchangeably and unless the proposal is specifically for only a single most basic (cannot be broken down any further) material unit or material component, the proposal shall mean and be measured in terms of all the -materials required for each use in the Project as a final in place assembly or system.

C. Material Composition: Where word “material composition” is used, this word is to mean the actual scientific makeup of the product with percentage of each material or chemicals going in to make up the final product being evaluated. Material Safety Data Sheets are to be provided when available. Words such as “100% acrylic” or “100% urethane” or other words to that effect are not acceptable when the product is not in fact only made up of that material alone.

D. Limitations: Where word “limitations” is used in conjunction with products being evaluated in proposals by the Architect, this word is to mean “anything” which could reduce or be less than any quality or any characteristic of the product as required for use in the Project at “any time” during its life expectancy, including its “life expectancy”; when compared to the specified product, when compared with other competitive generic products of the same type, and when compared with other competitive products that basically are designed for the same functional purpose. Examples include, but are not limited to, following.

1. Incompatibility with Other Materials: Where any contacting material is deleterious to the other, e.g. electrolysis, corrosion, contamination, chemical sensitivity, bacteria or plant growth (mildew or algae growth, etc.), or any other deleterious material effects.
2. Life Expectancy: Shorter life expectancy than specified materials.

3. Weatherability: Not as weatherproof as specified product, e.g., water leakage, air leakage, ultra-violet exposure, breath ability, and hydrostatic pressure effects.
4. Structural: Strength of product compared with specified material, e.g. compressive, tensile, and durometer hardness characteristics.
5. Durability: Resilience of product compared with specified material. Its ability to withstand physical abuse and movement, e.g. impact resistance, abrasion resistance, puncture resistance, and elongation.
6. Fire Resistance: Ability to resist various fire exposures.
7. Product Characteristics: Susceptibility to defects occurring due to the characteristics unique to the product, e.g., sensitivities such as those due to material composition (shelf life, curing methods, etc.), configuration, weight, size, substrate conditions, weather conditions, assembly conditions, applications methods, etc.
8. Other Characteristics: e.g., slip resistance, acoustic properties, and resistance to catastrophic events, etc.

1.03 SUBMITTALS

A. Substitution: Submit complete, readable, and organized information, with all proposal data applicable to Project highlight marked. Information to include, but not necessarily be limited to, following.

1. Product Data:

a. Published Data: Submit Primary Product Manufacturer's complete available published product data including, but not limited to, primary product descriptions, related product descriptions, color/pattern/texture charts, specifications, drawings, laboratory tested data, fabrication/installation instructions, and list of comparable Projects in Hawaii and other similar salt air/humid environments, such as Florida or any of the Southern States bordering the Gulf of Mexico.

b. Comparison products:

i. Requirement: Submit a detailed comparison of the significant generic qualities of the proposed substitution with those of the work originally specified.

ii. Characteristics: List significant qualities including, but not necessarily limited to, following.

a). Material composition.

b). Sizes.

c). Weight/density.

d). Color, textures, patterns available.

e). Qualities critical to performances, including tests performed.

f). Limitations of product.

g). How long used in Hawaii?

h). How long available in U.S.?

i). Current market share in Hawaii based upon specific material?

j). Current market share in U.S based upon specific material?

k). Current market share in Hawaii based upon all competitive materials serving same function?

l). Current market share in U.S based upon all competitive materials serving same function?

iii. Format: Submit in a typewritten table format in which characteristics are compared side by side.

2. Samples: Submit samples. Provide additional samples or small-scale mockups, if requested, by Architect. Samples to be submitted in accordance with Section 01330 – SUBMITTAL PROCEDURES requirements.

3. Project Modifications: Where standard published drawings are not adequate, submit other drawings or legible to scale sketches to show each of following where applicable to Project.

   a. Where Project dimensions would be affected, indicate with some typical examples how product affects Project dimensions.

   b. Show custom modifications of product which are required for Project.

   c. Show additional work required of other Installers which is not otherwise shown.

   d. If any, penetrations are required through work, show how penetrations through work is to be accomplished, including any multiple penetrations.

4. Changes to Other Work: Submit a list of written changes to the work of other Installers that would be necessary to accommodate the proposal.

5. Cost Proposal:

   a. During Bidding Period: Do not provide.

   b. Post Bidding Period: Submit. Indicate the overall net change, if any, in the Contract Sum. Separately list cost of proposed Work, cost of changes to other Work, Contractor's cost, cost for Architect's time (verified from Architect) and other miscellaneous costs.

6. Certifications: Sign certifications indicated on form.

7. Substitution Proposal Form: In addition to other required data and samples, submit completed proposal form as provided by the Architect.

1.04 QUALITY ASSURANCE

A. Objective: It is up to those making the pro prove to the Architect that the proposed products will meet the Project requirements. To the extent that the Proposer wishes to pursue the Work, the Architect reserves the right to request any information and samples necessary for him to make a decision.

B. Quality of the Proposals: It is intended that the physical appearance and dimensions of the Project and the quality of the specified products required by

the Contract Documents be maintained, unless otherwise specifically requested by and acceptable to Architect or Owner. Generally, submit proposals that would result in installations of equivalent quality to that specified.

C. Conditions for Consideration of a Proposal: The Contractor's proposals will be received and considered when extensive revisions to the Contract Documents are not required, when the proposed changes are in keeping with the primary intent of the Contract Documents, when the requests are timely, fully documented and properly submitted, and when one or more of the following conditions are satisfied.

1. Where the proposal is directly related to an "or equal" or "comparable product" clause or similar language in the Contract Documents.
2. Where the specified product or method cannot be provided within the Contract Time. Do not submit proposals which have resulted from the Contractor's failure to pursue the work promptly or to coordinate the various activities properly.
3. Where the specified requirements cannot receive necessary approval by a governing Authority, and the requested proposal can be approved.
4. Where a substantial advantage is offered the Owner, in terms of cost, time, energy conservation, or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. These additional responsibilities may include such considerations as additional compensation to the Architect for redesign and evaluation services, the increased cost of other work by the Owner or separate contractors, and similar considerations.
5. When the specified products or methods cannot be provided in a manner which is compatible with other materials of the work, and where the Contractor certifies that the substitution will overcome the incompatibility.
6. When the specified products or methods cannot be properly coordinated with other materials in the work, and where the Contractor certifies that the proposed substitution can be properly coordinated.
7. When the specified products or methods cannot receive a warranty as required by the Contract Documents and where the Contractor certifies that the proposed substitution can be given the required warranty.

D. Factors Affecting Acceptance of Proposals:

1. Review Intent: It is intended to give all responsible proposals a fair review, however, the Architect and Owner reserves the right to deny acceptance of any proposal for any reason. Irresponsible use of proposal process may result in termination of the review process in its entirety by Architect and Owner.
2. Basis of Design:
    a. Requirement: Where favorable consideration is given any proposed product which is different (not comparable as determined by Architect) than the specified product (basis of design); Contractor is required to secure a bid from the same Manufacturer of product in which design is based for a product it feels is comparable to the new proposed product under consideration; unless such product does not exist.

b. Submittal: Submit written confirmation from Manufacturer of product for which design is based; either indicating that he has no comparable product or that it has provided a new Bid that is comparable to product under consideration. Submit confirmation and product literature of recommended product along with submittals required for proposed product.

3. During Bidding Period: Time period allotted to Architect for review of submittals is short. It is critical full documentation be received and that documentation complies strictly with requirements specified in “Documentation” paragraphs herein.

4. Post Proposal Period: No proposals will be considered, unless Owner specifically directs Architect to review Project for possible cost reductions through value engineering. Where value engineering is considered, then only the product(s) for which the Contractor is directed to look at by the Architect shall be considered by the Architect.

5. Documentation:

a. Intent, Information Access: Competitors should be fully aware of the advantages and disadvantages of their products and of their competitor’s products. Should any knowledge be lacking, each competitor should be fully capable of accessing and securing accurate information. Where this is not possible, and unless the product is proprietary, these competitors should not offer proposals for this Project.

b. Quality of Information in Proposal: The Architect should be able to fully and accurately evaluate the difference between the specified product(s) and the proposed product(s) from each proposal. Do not to submit proposals with least amount of information possible without his prior knowledge, as there is no reason for the Architect to reconsider any proposal that has been “not accepted” for any reason, including one that is not adequately documented in the Architect’s opinion.

c. Reduction of Information Provided: When acceptable to the Architect, the extent of the submittals may be reduced when approved by Architect prior to the submission of each proposal. Generally, these will be for obvious products which are and fall into generic categories very familiar to the Architect. Where the Architect agrees to reduce the amount of information to be provided, the Architect reserves the right to expand the requirement again where the Architect feels that the proposal “objective” was not achieved.

d. Comparison of Products: In addition to the other required submittals, the “Comparison of Products” table is a key submittal to the whole proposal and is a requisite to acceptance. This submittal is not to be deleted.

E. As Part of Work-Related Submittals: Submission of unspecified products or methods as part of ‘work-related” submittals, does not constitute an acceptable or valid method for processing substitution proposals. Successfully reviewed “work related” submittals does not indicate approval of unspecified products or methods.

F. Architect's Requirements: Verify prior to submission of any proposal, the Architect's requirements necessary to fully conform proposal to Contract requirements. Request for additional costs after acceptance of any proposals will be denied.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 PROPOSAL PROCESS

A. Proposals Offered During Bidding Period:

1. Submission: In accordance with the "Instructions to Bidders" and its supplements.

2. Acceptable Proposals: Architect to send written notification to each eligible Bidder of acceptance of the proposal with copies of the accepted proposal. Eligible Bidders may incorporate the substitutions in accordance with the accepted proposal.

3. Proposals Not Accepted: Architect to send each proposal that are not accepted back to the Bidder who originated the proposal. Architect to have mark the proposal "Not Accepted". Bidder may resubmit proposal, where specified time period allowed for review of proposals is not exceeded and where resubmission is acceptable to Architect. Refer to Architect's "Comments" for additional requirements suggested for compliance, if any.

B. Post Bidding Period Proposals:

1. Submission: As directed by Architect.

2. Acceptable Proposals:

a. Preliminary Acceptance: Where marked "Acceptable, Preliminary" on form, indicates that further information may be required before a decision is made. Comply with "Comments" on form and where not indicated verify additional requirements from Architect, and resubmit a complete proposal conforming to new requirements. Adjust costs if required. Use of proposed products are not allowed, until "Acceptable, Final" is marked on the proposal.

b. Final Acceptance: Where marked "Acceptable, Final" on form, proposals and any other attachments to become basis of Contract.

3. Proposals Not Accepted: Where marked "Not Accepted", resubmission may be allowed when Architect indicates "Resubmission Acceptable" and resubmission will be denied when Architect indicates "Resubmission Denied" on form. Where remarks are indicated under "Comments", comply with any further requests which may be indicated.

3.02 INCORPORATION

A. Incorporation of Proposals: Coordinate work with other affected Installers of other Work. Comply in strict accordance with accepted proposal that should be in strict conformance Product Manufacturer's Project specific requirements.

END OF SECTION

August 16, 2021

SECTION 01770 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Repair of the Work.

B. Related Sections:

1. Section 01330 – SUBMITTAL PROCEDURES.
2. Section 01595 - PROJECT CLEANING.
3. Section 01785 - PROJECT RECORD DOCUMENTS

1.02 SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

D. Certificates of Release: From authorities having jurisdiction.

E. Certificate of Insurance: For continuing coverage.

1.03 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.04 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items (Contractors Punch List): Prepare and submit a list of items to be completed and corrected at the time of each inspection, indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 calendar days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final

completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.

3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner's Representative. Label with manufacturer's name and model number where applicable.
    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
5. Submit test/adjust/balance records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 calendar days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
6. Advise Owner of changeover in HVAC and other utilities.
7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
8. Complete final cleaning requirements, including touchup painting.
9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Owner's Representative will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

2. Results of completed inspection will form the basis of requirements for final completion.

1.05 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 01290 - PAYMENT PROCEDURES.

2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Owner's Representative will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.06 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use Contractors form and format acceptable to the Architect

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.

2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3. Include the following information at the top of each page:

a. Project name.

b. Date.

c. Name of Architect and Owner's Representative.

d. Name of Contractor.

e. Page number.

4. Submit list of incomplete items in the following format:

a. PDF electronic file. Architect will return annotated file.

1.07 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

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

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

4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.

2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

August 16, 2021

SECTION 01785 – PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Contract Closeout Record Documents.
2. Construction Photographs

B. Related Sections:

1. Division I Sections, General.
2. Section 01770 – CLOSEOUT PROCEDURES.
3. Division 15 Sections.
4. Division 16 Sections.
5. Other Sections requiring Project Record Documents.

1.02 DEFINITION

A. Contract Closeout Record Documents: Contractor produced documents representing an accurate record of Work provided under Contract. Documents Include updated Contract Documents with support data and Operation & Maintenance Manuals.

1.03 SUBMITTALS

A. Contract Closeout Record Documents:

1. Contract Documents: Submit three (3) sets and PDF electronic files of each of following, except as otherwise indicated.
    a. Updated Contract Drawings.
    b. Updated Project Manual.
    c. Other drawn and written support data for Drawings and Project Manual necessary to show record of Work.
2. Operating/Maintenance Manuals: Submit three (3) sets and PDF electronic files.
3. Certification: On transmittal or separate written document, certify that information provided is complete and accurate. Signature document by Contractor.
4. Distribution: Architect, Owner's Representative, Owner, and Operator.

B. Quality Assurance Submittals: Submit in accordance with "Quality Assurance" paragraphs herein.

1.04 QUALITY ASSURANCE

A. Contract Closeout Record Documents:

1. Up-to-Date Records: Maintain up-to-date documents during Contract Period. Record data not less than ten (10) working days after installation of each specific portion of Work requiring recording, except record data prior to any concealment of the Work.
2. Availability: Documents are to be made available to Architect at any time for his review. Timely recording of information and accuracy of recorded information is responsibility of Contractor; whether or not reviewed by Architect.
3. Out-of-Date Records: If in opinion of Architect, records are not being timely recorded by Contractor, Owner reserves the right to hire a professional third party service in which to input the required data. If such service is required, Contractor to cooperate with third party service as necessary for third party service to properly and in timely manner record required data. Contractor to pay for all costs associated with securing and maintaining such service for period such service is required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 MAINTENANCE OF DOCUMENTS

A. Storage: Store documents on or in equipment designed for filing and storage of such documents, including rack and filing cabinets. Locate Contract Documents used for Contract Closeout Record Documents in fire resistant cabinet.

B. Handling: Maintain documents in clean, dry and undamaged condition. Use documents only as necessary to record required information. Do not use as construction set.

3.02 CONTRACT CLOSEOUT RECORD DOCUMENTS – DRAWINGS AND SPECIFICATIONS

A. Time of Submission: Refer to Division 1 Contract Closeout.

B. Intent: Update information shown on Contract Drawings and in Project specifications which differ from what was originally drawn or specified. Record drawn information accurately to scale. Written data to be legibly printed.

C. Contract Drawings and Project Specifications: Keep record documents current. Legibly mark with erasable red pencils or other contrasting colored pencils when more than one color may more clearly delineate the recorded information. Where recorded to Contract Drawings, record information to same scale as drawing. Colored pencil marks to be visible on background of sheet to which marks are applied.

1. Content: Types of items requiring marking include, but are not limited to, the following:
    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Depths of foundations below first floor.

d. Locations and depths of underground utilities.

e. Revisions to routing of piping and conduits.

f. Revisions to electrical circuitry.

g. Actual equipment locations.

h. Duct size and routing.

i. Locations of concealed internal utilities

j. Changes made by Change Order or Construction Change Directive.

k. Changes made following Architect's written orders.

l. Details not on the original Contract Drawings.

m. Field records for variable and concealed conditions.

n. Record information on the Work that is shown only schematically

2. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

D. Supporting Data: Other documents may be used in lieu of Contract Documents, when complying with following.

1. Conditions for Acceptance:

a. Documents capable of more clearly showing actual installations provided.

b. When documents are required as drawings, drawn elements are to be in an Architect acceptable architectural scale.

c. Each document is referenced to Contract Documents in logical manner that documents used can be readily identified with the affected Contract Document work.

d. Submittal format is complied with.

2. Types of Base Documents available for Use:

a. Product Data: May be used in place of Contract Drawings or Specifications.

b. Shop Drawings: May be used in place of Contract Drawings.

c. Other Documents: Any other documents officially used for Project and previously reviewed by Architect in submittals may be used when acceptable to Architect.

3. Submittal Format:

a. Intent: Sequentially organize data as referenced in Contract Documents. Data may be provided in either bound or filed format as specified in paragraphs below. Each data to be indexed and clearly identified with typewritten labels.

b. Bound Data: Provide in format similar to that required for Operations & Maintenance Manuals; except each drawing is to be neatly folded in 8-1/2” x II” format and inserted into pocket type jackets manufactured for binder insertion.

c. Filed Data: Provide filed data in “Bankers Box” as manufactured by Fellowes or comparable heavy-duty card board box acceptable to Architect. Each data to be filed into logical groupings in file folders and clearly identified. Drawings are to be neatly folded to fit file folder format.

d. Marking Data: Mark Project applicable data. Utilize permanent contrasting markers. Written data to be highlight marked with transparent markers. Drawn data to be with opaque markers. Do not obscure other information.

E. “Record Documents” Labeling:

1. General: Stamp each page in permanent ink, words “RECORD DOCUMENTS”, in bold capital letters, on bottom outside corner; unless otherwise acceptable to Architect. Do not obscure any existing information. Each page means both sides of sheet where printed matter occurs on both sides.

2. Drawings: Letters of stamp to be 3/4” height minimum.

3. Project Manual: Letters of stamp to be 1/4” height minimum.

4. Support Data: Letters of stamp to be 1/4” height minimum. Single stamped label may be applied when data is on single folded page or in permanently bound format such as spiral bound or paper back book type binding.

3.03 CONTRACT CLOSEOUT RECORD DOCUMENTS - OPERATING/MAINTENANCE MANUALS

A. Format:

1. Binders: Assemble data in hard covered, slant ring binders with 3 rings and non-glare, see through pockets on front of each cover and on spine. Insert in spine pocket and front cover pocket project name, Owner’s project identification number, summary of typical contents, and volume identification in a “volume of volumes” format.

2. Indexed Data: Index data. Provide identification on each index.

3. Data Format:

a. Table of Contents.

b. General Data.

i. Primary Contractor/Subcontractor List.

ii. Record Documents List.

iii. Contractor’s Project Guarantee.

iv. Permits.

c. Group (Specification Section) Data.

i. Contractor/Subcontractor List.

ii. Operation, Service, Maintenance Data.

iii. Guarantees/Warrantees.

iv. Permits/Certificates.

B. Table of Contents:

1. Index Related: Provide copies in each volume and at front of each volume. Indicate summary of contents in each indexed grouping.

2. Group Related: For each group of indexed data, in front of group data, include table of contents specific to group.

C. General Data:

1. Primary Contractor/Subcontractor List: Submit complete listing of all primary Subcontractors and Suppliers involved with Work, including with General Contractor at top of list. Organize list in accordance with Table of Contents CSI Specification Numbers and Names. Relate each Subcontractor and Supplier to Specification Section under which work was provided. Provide each entity's company name, address, phone number, CEO, and primary person or persons involved with Project.

2. Contractor's Project Guarantee: For Owner's copy submit insert original signed guarantee. For other required submittal sets include copies of signed guarantee.

3. Records Documents List: Complete typed listing of Drawings and Specifications Sections used as final Record Documents for Project.

4. Permits: Copies of all final signed permits required for Work.

D. Group Data: Create a group of related data for each specific system, product, or equipment required for Record Documents. Organize each group sequentially by Specification Number. Each page of each data in group to be identified with hand written or typewritten number identifying them with "group" Specification Number. Permanently bound data may have single identification on front of page. Stapled, clipped, or similarly fixed data are not considered as "permanently bound" and are to have required identification on each page. Accurately provide three hole punched or drilled holes necessary for insertion into binders. For each group, provide following information.

1. Contractor/Subcontractor List: Submit complete listing with Company name, address, phone number, CEO, and primary person or persons involved with Project. Repeat data even if listed under "General Data, Primary Contractor/Subcontractor List".

2. Reviewed Submittals: For each group, submit Product Data and other written submittal data successfully reviewed by Architect during Contract Period.

3. Guarantees/Warrantees: For each group, submit following.

a. Standard Manufacturer's Warrantees: Include when normally provided with product; whether specified or not.

b. Special Warrantees: Include when specified for products.

4. Operation, Service, Maintenance Data: When specified, submit required data. Where parts listings are available from Manufacturer of product, submit written data of parts listings and service company listings.

END OF SECTION

DIVISION 2 – SITE CONSTRUCTION

SECTION 02070 – SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

A. Work Includes:

1. Demolition and removal of designated partitions, doors, flooring, ceilings, soffits, mechanical, plumbing and electrical fixtures, finishes and components as indicated on the Drawings
2. Demolition of portions of concrete slabs.
3. Demolition of portions of concrete slabs for removal of designated utilities.
4. Identifying, disconnecting, capping or sealing, and removing utilities.
5. Salvage designated items.

B. Related Work Described Elsewhere

1. Section 01010 – SUMMARY OF WORK
2. Section 01310 – PROJECT MANAGEMENT AND COORDINATION
3. Section 01500 – TEMPORARY FACILITIES AND CONTROLS
4. Section 01595 – PROJECT CLEANING
5. Section 01770 –CLOSEOUT PROCEDURES

C. The extent of selective demolition work is indicated on the demolition plan and other drawings.

D. It shall be the responsibility of the Contractor to examine the project site and determine the existing conditions for themselves.

E. Selective demolition work includes but is not limited to removal and subsequent disposal of all non-hazardous materials indicated or required to be removed.

F. Execute all work in an orderly and careful manner with due consideration for all items or work to remain.

G. Clearly obvious conditions requiring selective demolition, which exist at the site, shall be accepted as part of the work, even though they may not be clearly indicated on the Drawings and/or described herein, or may vary therefrom.

H. All debris of any kind accumulated from the work of this Section shall be disposed of off the site, unless noted otherwise.

I. Permits, Notice, Etc.:

1. The Contractor shall procure and pay for all necessary permits or certificates the may be required in connection of this work.

2. The Contractor shall serve proper notice and consult with Project Manager regarding any temporary barricades that are required, or for disconnections of electrical or other utility lines in the area which may interfere with the removal work. All such lines, where necessary, shall be properly disconnected or relocated prior to commencing with demolition work.

1.02 SUBMITTALS

A. Meet requirements of Section 01330 – SUBMITTAL PROCEDURES

B. Proposed Protection Measures: Submit informational report, including drawings, that indicates the measures proposed for protecting individuals and property, for dust control and for noise control. Indicate proposed locations and construction of barriers.

1. Adjacent Portions of Building: Portions of the site, including structures, adjacent to the areas to be demolished are to be kept intact. The demolition to take place in these areas is to be performed with the utmost care to avoid damage to the adjacent structures. Submit detailed special measures proposed to protect adjacent structures to remain.

C. Schedule of Demolition Activities: Indicate the following:

1. Detailed sequence of demolition work, with starting and ending dates for each activity.

2. Temporary interruption of utility services.

3. Shutoff of utility services.

D. Demolition Plans: Drawings indicating the following:

1. General site, building(s) and other features to be removed and disposed of.

2. Locations of temporary protection and means of egress for adjacent occupied areas of the building.

E. Pre-demolition Photographs: Show existing conditions of adjoining construction, including finish surfaces that might be misconstrued as damage caused by demolition operations. Submit before the Work begins.

1.03 QUALITY ASSURANCE

A. Use adequate numbers of skilled mechanics who are thoroughly trained and experienced in the necessary crafts.

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

C. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Section 01310 – PROJECT MANAGEMENT AND

COORDINATION. Review methods and procedures related to building demolition including, but not limited to, the following:

1. Inspect and discuss condition of construction to be demolished.
2. Review and finalize demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review and finalize protection requirements.
4. Review procedures for noise control, and dust control.
5. Review items to be salvaged and returned to the owner.
6. Review procedures for protection of adjacent, occupied structures or buildings.
7. Review schedule of work hours and facility rules.

1.04 PROJECT CONDITIONS

A. Existing conditions: The owner assumes no responsibility for actual condition of items to be demolished.

B. Conditions existing at time of commencement of contract will be maintained by the owner insofar as practical.

C. Occupancy: Building areas subject to demolition will be vacated and discontinued in use by the owner prior to start of work.

D. Do not interfere with use of adjacent building areas. Maintain free and safe passage to and from occupied spaces.

E. Provide accessibility around temporary structures conforming to ADAAG Section 4.1.1(4).

F. Prevent movement or settlement of structures. Provide and place bracing or shoring and be responsible for safety and support of adjacent structures. Assume liability for such movement, settlement, damage, or injury. Cease operations and notify the Project Manager immediately, if safety of structure appears to be endangered. Take precautions to properly support structure. Do not resume operations until safety is restored.

G. Traffic: Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close, block or otherwise obstruct streets, walks or other occupied or used facilities without written permission from the Project Manager. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations, as directed by the Project Manager.

H. Comply with Section 01500 – TEMPORARY FACILITIES AND CONTROLS for environmental controls including dust and noise control.

I. Fire Safety: Fire safety during demolition shall comply with Section 16 of the 2012 NFPA 1 - Fire Code, as amended and NFPA 241.

1.05 EXISTING UTILITY SERVICES

A. Do not abandon or otherwise alter utility services or drainage lines which would impair service to existing building areas.

B. Maintain utilities in service, protect, and reconstruct if damaged, all in-service utility pipes or conduits, except services to the structures to be dismantled. Reconstruct in-service utility pipes or conduits if damaged at no additional cost to the owner.

C. If service must be interrupted, observe requirements of Section 01500 – TEMPORARY FACILITIES AND CONTROLS.

D. Report damage, however slight, immediately. Do not repair or reconstruct any utility pipe, conduit or installation without authorization; however, except perform emergency repairs immediately.

1.06 HAZARDOUS MATERIALS

A. Hazardous Materials**:** It is not expected that hazardous materials, other than the lead found in existing lead-line elements, will be encountered in the Work.

1. Contractor shall comply with Hawaii Administrative Rules (HAR) Chapter 11-501. Pursuant to Section 11-501-7, prior to the commencement of work, thoroughly inspect the project site for the presence of asbestos, including category I and category II nonfriable ACM. This survey shall be performed by a person who is certified pursuant to HAR Chapter 11-504. The inspector shall include sampling and laboratory analysis of the asbestos content of all suspected ACM. Sampling shall include at least three samples from each homogeneous area to be disturbed. Provide Owner with results of sampling and laboratory analysis.

2. If hazardous materials are encountered, immediately notify Architect and Owner/Construction Manager. The Contractor shall then furnish all labor, materials, facilities, equipment, services, employee training and testing, permits and agreements, waste transport and disposal necessary to remove and dispose of all hazardous materials in strict accordance with the requirements of the EPA/Department of Health, Hawaii Occupational Safety and Health Standards, State of Hawaii Regulations and any other applicable Federal, State and local government regulations. Normal demolition operations shall commence only after the hazardous material has been remediated or abated

3. In the event that asbestos, lead containing paint, urea formaldehyde or other toxic substances are present in the existing structures, observe the applicable

requirements of Hawaii Occupational Safety and Health Standards, State of Hawaii.

4. Notify employees, Subcontractors and all other persons engaged on the project of the presence of hazardous materials in the existing building in accordance with the requirements of the Occupational Safety and Health Standards, State of Hawaii.

1.07 COORDINATION

A. Arrange demolition schedule so as not to interfere with the owner's on-site operations and operations of adjacent occupied buildings and areas.

1. At the end of each work period areas are required to be cleaned and readied for occupants. The condition of the areas shall be such that there is no interference with the typical work activities perform by the occupants and that the occupant's safety is not compromised

PART 2 - PRODUCTS

2.01 SALVAGE MATERIALS

A. Salvaged materials not indicated for reuse or salvage for the owner shall become Contractor's property. Remove from site and dispose of at Contractor's option.

1. Items to be salvaged for Owner not indicated in the Contract Documents will be identified at the Pre-Construction meeting walk-through.

B. Items of salvageable value not indicated for reuse may be removed from structure as work progresses. Salvaged items must be transported from site as they are removed. Storage or sale of removed items on site will not be permitted.

C. Historic items, antiques, and similar objects including, but not limited to, commemorative plaques and tablets, and other items of interest or value to the owner that may be uncovered during demolition remain the property of the owner.

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

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine the conditions under which work of this section will be performed. Do not proceed until unsatisfactory conditions detrimental to timely and proper completion of the work have been corrected.

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

C. Inventory and record the condition of items to be removed and salvaged. Photograph existing conditions of structure surfaces, equipment or to surrounding properties which could be misconstrued as damage resulting from selective demolition work. File with Project Manager prior to starting work.

D. Engage a professional engineer currently licensed in the owner to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.

E. If hazardous materials were found to exist, verify that hazardous materials have been remediated before proceeding with building demolition operations.

3.02 PREPARATION

A. Maintain exit requirements throughout construction period.

B. Erect and maintain temporary barricades complying with the requirements of Section 01500 – CONSTRUCTION FACILITIES. On completion, remove barricades and repair damaged surfaces to match adjacent surfaces.

C. Existing Utilities: Locate, identify, disconnect, and remove indicated utilities serving portions of the building to be demolished.

1. If removal, relocation, or abandonment of utility services will affect adjacent occupied areas and buildings, then provide temporary utilities that bypass the portions of the building to be demolished and that maintain continuity of service to other buildings and adjacent areas.

2. Cut off pipe or conduit and cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.

D. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

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

3.03 DEMOLITION

A. Demolition Work: Conform to owner of Hawaii, Occupational Safety and Health Standards; Subtitle 8, Division of Occupational Safety and Health; Part 3, Construction Standards; Chapter 131.1, Demolition.

B. Pollution controls: Provide temporary enclosures and use suitable methods to limit dust and dirt to the lowest practical level. Comply with governing regulations pertaining to environmental protection. Observe dust control measures of Section 01567 – POLLUTION CONTROL.

C. Explosives: Use of explosives will not be permitted.

D. Selective Demolition

1. Extent of demolition and removal as shown are minimum requirements. Contractor shall be responsible for the extent of work required to properly accommodate the methods of construction required for the new work. Additional work required to accommodate construction shall be considered incidental to the new work and shall be done at no additional cost to the owner. Contractor and its demolition subcontractor, as part of the bid proposal to review the demolition scope along with the new work and conduct site visit(s) to understand the extent of the scope and provide as part of its bid proposal, to include all work to accomplish the final work.

2. Conduct demolition of designated items and components as indicated on the Drawings and site investigation(s) in an orderly and careful manner as required to accommodate new work, including that required for connection to the existing building. Protect existing supporting structural members.

3. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

4. Use the utmost care to avoid damage to the items being removed and designated for reuse including but not limited to:

5. Disconnect, remove, cap and seal designated utilities as indicated on the Drawings.

6. Use methods required to complete the Work within limitations of governing regulations.

7. Locate demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

8. Cease operations and notify Architect and Project Manager immediately if safety of adjacent structure appears to be endangered. Do not resume operations until safety is restored.

9. Remove contaminated, vermin infested, or dangerous materials encountered and dispose of by safe means.

10. Do not demolish, chip or penetrate any portion of existing structural members not designated for such without the expressed approval of the Architect and Engineer.

11. Repair excess demolition to match adjacent surfaces.

E. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.

2. Pack or crate items after cleaning and repairing. Identify contents of containers.

3. Protect items from damage during transport and storage.

4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

3.04 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove debris, rubbish, and other materials resulting from demolition operations from the site. Transport materials removed from demolished structures and legally dispose of off site.

B. Do not allow demolished materials to accumulate on-site.

C. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

D. Burning of removed materials from demolished structures will not be permitted on site.

3.05 CLEANUP AND REPAIR

A. Repair damage to adjacent structure and improvements resulting from this work at no cost to the owner.

B. Clean adjacent areas, structures and improvements of dust, dirt, and debris caused by demolition operations, as directed by Project Manager or governing authorities. Return adjacent areas to condition existing prior to start of work.

END OF SECTION

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

1.02 DEFINITIONS

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

B. Vapor Barrier: Sheathing which is applied beneath slab-on-grade to prevent moisture or vapor from beneath the slab from transmitting through to the top. The term Vapor Barrier shall be interchangeable with Moisture Barrier.

1.03 SUBMITTALS

A. Submit in SUBMITTAL PROCEDURES.

B. Product Data:

1. Reinforcing steel - Certified mill test results or laboratory test results. Indicate bar size, yield strength, ultimate tensile strength, elongation and bend test. Provide chemical composition for rebars that are to be welded.

C. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mix water to be withheld for later addition at Project site.

D. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, “Details and Detailing of Concrete Reinforcement.” Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified licensed professional engineer detailing fabrication, assembly, and support of formwork. Design and engineering of formwork are Contractor’s responsibility.

1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, reshoring, and final removal of shoring.

F. Welding Certificates: Copies of certificates for welding procedures and personnel if welding is required.

G. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance with the requirements indicated, based on comprehensive testing of current materials.

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

1. Form materials and form-release agents.

2. Steel reinforcement and reinforcement accessories.

3. Curing materials.

4. Floor and slab treatments.

5. Bonding agents.

6. Vapor barriers.

7. Joint-filler strips.

8. Repair materials.

I. Minutes of pre-installation conference.

1.04 QUALITY ASSURANCE

A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for formwork and shoring and reshoring installations that are similar to those indicated for this Project in material, design, and extent.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

E. Welding: Qualify procedures and personnel according to AWS D1.4, “Structural Welding Code--Reinforcing Steel ” if welding is required.

F. ACI Publications: Comply with the following, unless more stringent provisions are indicated and maintain a copy at the field office.

1. ACI 301, “Specification for Structural Concrete.”

2. ACI 117, “Specifications for Tolerances for Concrete Construction and Materials.”

3. ACI 347R “Guide to Formwork for Concrete”

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

1. Avoid damaging coatings on steel reinforcement.

PART 2 - PRODUCTS

2.01 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Comply with ACI 347R. Provide new or good finish form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other ACI 347R approved panel materials.

2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

a. High-density overlay, Class 1, or better.

b. Medium-density overlay, Class 1, or better, mill-release agent treated and edge sealed.

c. Structural 1, B-B, or better, mill oiled and edge sealed.

d. B-B (Concrete Form), Class 1, or better, mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

E. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

F. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum. If no chamfer (sharp corners) are specified by Architect, contractor shall do a mockup of corners to ensure that corner edges are completed to the standards required by the Architect.

G. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces. Form oils or waxes shall not be used for concrete surfaces intended to be painted.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

H. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal. The Architect may require that the snap tie holes be part of the finish feature of the concrete. If this is the case the Contractor shall do a mockup. The Contractor shall not proceed until the mockup is approved by the Architect.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of the exposed concrete surface.

2. Furnish ties that, when removed, will leave holes not larger than 1-1/2 inches in diameter in concrete surface.

3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.02 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed, unless otherwise noted on the drawings.

2.03 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place that will not puncture the vapor barrier. Use plastic straps or brightly colored tie wires to secure reinforcing. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected. Refer to paragraph 3.06 for chair support spacing.

B. Round Dowel Bars at Slab-On-Grade Joints: Hot-dipped galvanized ASTM A 36 rods. Galvanize in accordance to ASTM A 123.

C. Zinc Repair Material: ASTM A 780, zinc-based solder, paint containing zinc dust, or sprayed zinc.

2.04 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I.

B. Pozzolans

1. Fly Ash: ASTM C 618, Class C or F.

2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

C. Silica Fume: ASTM C 1240, amorphous silica.

D. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:

1. Class: Moderate weathering region, but not less than 3M.

2. Aggregate Size: 1-1/2 inches (38 mm).

3. Aggregate Size: No. 57 (1 inch to No. 4).

4. Aggregate Size: No. 67 (3/4 inch to No. 4).

E. Size of Coarse Aggregate: Except when otherwise specified or permitted, maximum size of coarse aggregate shall not exceed three-fourths of the minimum clear spacing between reinforcing bars (or bundled bars), one-fifth of the narrowest dimension between the sides of forms, or one-third of the thickness of slabs or toppings.

F. Water: Potable and complying with ASTM C 94 or non potable meeting ASTM C-94 Acceptance Criteria for Questionable Water Supply. Use only potable water for job site mixing.

2.05 ADMIXTURES

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

B. Air-Entraining Admixture: ASTM C 260.

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

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

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

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

G. Corrosion-Inhibiting Admixture: Integral Waterproofing admixture, KIM HS by Kryton International.shall be added to the concrete in dosage as recommended by the manufacturer.

2.07 VAPOR BARRIERS

A. Vapor Barrier: ASTM E 1745, Class A except as modified in Subpargraph 1. below, nylon- or polyester-cord-reinforced three-ply high-density polyethylene sheet or one-ply extruded polyolefin sheet; 15 mil minimum thickness, such "STEGO" shall be used. Compliance to ASTM standards shall be confirmed by an independent testing agency.

1. Permeance Rating: ASTM E96, ASTM E154 not exceeding 0.006 gr/ft^2/hr.

2.08 FLOOR AND SLAB TREATMENTS

A. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of silicon carbide, or fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide; unaffected by moisture, and cleaning materials.

B. Unpigmented Mineral Dry-Shake Floor Hardener: Factory-packaged dry combination of portland cement, graded quartz aggregate, and plasticizing admixture.

C. Pigmented Mineral Dry-Shake Floor Hardener: Factory-packaged dry combination of portland cement, graded quartz aggregate, coloring pigments, and plasticizing admixture. Use coloring pigments that are finely ground, nonfading mineral oxides interground with cement.

1. Colors: Match Project's samples.

2. Colors: As indicated by referencing manufacturer's designations.

3. Colors: As selected by DAGS from manufacturer's full range for these characteristics.

D. Penetrating Liquid Floor Treatment: Chemically reactive, waterborne solutions of inorganic silicate or siliconate or polymerized polyester polymer or other materials and proprietary components; odorless; colorless; that penetrates, hardens, waterproofs or densifies concrete surfaces.

2.9 CURING MATERIALS AND EVAPORATION RETARDERS

A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

B. Water: Potable.

C. Clear, Solvent-Borne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

D. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.10 RELATED MATERIALS

A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:

1. Type II, non-load bearing, for bonding freshly mixed concrete to hardened concrete.

2. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

3. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

4.

E. Sleeves:

1. Schedule 40 pipe, galvanized per ASTM A53.

2. Schedule 40 PVC Pipe.

F. Reglets: Fabricate reglets of not less than (0.0217-inch) thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

G. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than (0.0336 inch) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations. Products shall contain no added gypsum.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.

2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.

4. Compressive Strength: Not less than 4000 psi (27.6 MPa) at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch. Products shall contain no added gypsum.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.

2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.

4. Compressive Strength: Not less than 5500 psi (39 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:

1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.

B. ALL concrete shall have 28-day compressive strength of 4,000 psi and water/cement ratio not exceeding 0.45. .

C. Cementitious Materials: For concrete exposed to deicers, limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements.

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

1. Fly Ash: 25 percent.

2. Combined Fly Ash and Pozzolan: 25 percent.

3. Ground Granulated Blast-Furnace Slag: 50 percent.

4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.

5. Silica Fume: 10 percent.

6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent portland cement minimum, with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

E. Do not add air entrainment to concrete of trowel-finished interior floors and suspended slabs. Do not allow entrapped air content to exceed 3 percent.

F. Limit water-soluble, chloride-ion content in hardened concrete per ACI 318 Chapter 4 for corrosion protection of reinforcing steel.

G. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.

2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

4. Use corrosion-inhibiting admixture in concrete mixes at all exterior walls, basement perimeter walls, exposed/exterior slabs-on-grade, and in columns exposed to exterior view.

5. Use integral waterproofing admixture in all interior slabs-on-grade. ASTM C 494.

2.14 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.15 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and ASTM C 1116 and furnish batch ticket information. Batch ticket information shall include design mix reference, water that can be added at the jobsite, and admixtures. For transit mixing, complete not less than 70 revolutions of the drum at the manufacturer's rated mixing speed. Discharge concrete into its final position within 90 minutes after introduction of batch water to the cement.

If a retarder admixture is used, the discharge time limit of 90 minutes may be increased by the time specified for retardation by the admixture manufacturer or the concrete supplier. Mix concrete a minimum of one minute at mixing speed immediately prior to discharge.

B. Project-Site Mixing: Measure, batch, and mix concrete materials according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd.0.76 cu. m or less, continue mixing at least one and one-half minutes, but not more than five minutes after all ingredients are in mixer, before any part of batch is released.

2. For mixer capacity larger than 1 cu. yd.0.76 cu. m, increase mixing time by 15 seconds for each additional 1 cu. yd.0.76 cu. m.

3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of concrete placement in structure.

4. Hand mixed concrete will not be allowed, except to make up shortages for fence post footing, thresholds, curbs and gutters, thrust block and utility trench encasements.

PART 3 - EXECUTION

3.01 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch.

2. Class B, 1/4 inch.

3. Class C, 1/2 inch1.

4. Class D, 1 inch.

D. Construct forms to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast

concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.

1. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds. Maintain the integrity of the vapor barrier membrane.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor bolts, accurately located, to elevations required.

2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3. Install dovetail anchor slots in concrete structures as indicated.

4. Install inserts, hangers, metal ties, nailing strips, blocking, grounds and other fastening devices needed for attachment of other work.

B. Locate electrical or mechanical conduits and fittings so that the strength of the concrete member is not impaired. “Conduits” include pipes, ducts, and electrical conduits. Unless required otherwise on the Drawings, conform to the following:

1. Suspended Concrete Slabs and Toppings: Do not embed conduits larger than 3/4-inch outside diameter s in concrete slab or topping. Conduits shall be spaced a minimum of 10 times their outside diameter. Avoid conduit crossings. Provide sleeve for conduits passing through slabs.

2. Concrete Slabs on Grade: Do not embedded conduits within the thickness of any concrete slab on grade. Place conduits in the subgrade below the concrete slabs, but not within the thickness of the basaltic termite barrier.

3.03 REMOVING AND REUSING FORMS

A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F(10 deg C) for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained. The 24 hour period may be reduced to 12 hours in compliance with ACI 347R with prior approval from the Architect.

B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:

1. At least 70 percent of 28-day design compressive strength (minimum requirement).

2. 28-day design compressive strength.

3. Determine compressive strength of in-place concrete by testing representative field or laboratory-cured test specimens according to ACI 301.

4. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Contracting Officer.

3.04 SHORES AND RESHORES

A. Comply with ACI 318, ACI 318M, ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.05 VAPOR BARRIERS

A. Vapor Barrier: Place, protect, and repair vapor-barrier sheets according to ASTM E 1643 "Standard Practice for Installation of Water Vapor Barriers" and manufacturer's written instructions. The more stringent shall apply.

1. Use the greatest widths and lengths practical to minimize lap joints. Seal laps joints and edges with tape or materials compatible with the vapor barrier. Remove and replace torn, punctured, or damaged vapor barrier materials, except when minor repairs or patches are allowed by manufacturer's instructions.

2. Do not cut or puncture vapor barrier. No penetrations of the vapor barrier allowed except for reinforcing steel and permanent utilities. Seal all penetrations including pipes and reinforcing. Repair damage and reseal vapor barrier before placing concrete.

3. Do not leave the vapor barrier exposed to ultraviolet radiation for more than a few days prior to the concrete pour. Remove standing water from the vapor barrier prior top concrete pour.

3.06 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Shop or field-weld reinforcement according to AWS D1.4, where indicated.

2. Support slab reinforcing bars as follows:

BAR SIZE	MAXIMUM DISTANCE BETWEEN SUPPORTS
#3	2 feet
#4	3 feet
#5	4 feet
#3 at 15" E.W.	4'-6" o.c. each way

WIRE FABRIC SHEETS	MAXIMUM DISTANCE BETWEEN SUPPORTS
12 x 12 - W2.9/w2.9	2'-0" o.c. each way

12 x 12 - W6/W6	3'-4" o.c. each way

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. Zinc-Coated Reinforcement: Use galvanized steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.

3.07 JOINTS

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

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Contracting Officer.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.

3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8 inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface. Saw-cut must be performed on the same day of the concrete pour.

   Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

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

   1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

   2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 7 Section “Joint Sealants,” are indicated.

   3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.08 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed. Provide one day notification to DAGS Representative for each scheduled pour.

B. Before placing concrete, water may be added at Project site, subject to limitations of ACI 301. Up to two gallons of water per cubic yard of concrete may be added at the jobsite provided the approved design mix accommodates the additional water.

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

C. Convey concrete from mixer to the place of final deposit rapidly by methods that prevent segregation or loss of ingredients and will insure the required quality of concrete. Use conveying equipment, conveyors, hoppers, baffles, chutes, pumps that are sized and designed to prevent cold joints from occurring and prevent segregation in discharged concrete. Clean conveying equipment before each placement.

D. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

E. Deposit concrete in forms in horizontal layers with proper consolidation into previous layers and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints. For high wall pours

(above 12 feet), Contractor must show its experience and demonstrate its proficiency before pours are permitted in excess of 12 feet.

1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.

2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.

3. Make construction joints only where located on Drawings unless otherwise approved by Architect. Plan pours to continuously place concrete from one construction joint to another.

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

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Maintain reinforcement in position on chairs during concrete placement.

3. Screed slab surfaces with a straightedge and strike off to correct elevations.

4. Slope surfaces uniformly to drains where required.

5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleed-water appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.10 CONCRETE SLABS ON GRADE

A. For interior areas, unless specified elsewhere, place concrete floor slabs directly over vapor barrier overlain atop granular cushion fill.

1. Place floor slabs in alternate panels, long strip pattern, and following construction or contraction joints. Saw cut construction may be used in lieu of placement in alternate panels as approved by the Architect..

2. Provide a bond-break filler strip, between concrete slab and abutting vertical surfaces and as detailed.

B. For exterior areas, unless specified elsewhere, place concrete floor slabs directly over granular compacted fill and reinforce slabs with synthetic fibers. Provide isolation and contraction joints where detailed and, at intersections, corners and at abutments. Place contraction joints not more than 15 feet apart, unless detailed otherwise.

1. Finish concrete true to grade, section and cross slope for sloped or crowned walks at 1.5% (1% minimum and 2% maximum). Round edges to 1/8" radius except saw-cut joints. Finish steps in connection with walks with same finish as walks.

3.11 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height.

1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.

2. Do not apply rubbed finish to smooth-formed finish.

C. Rubbed Finish: Apply the following to smooth-formed finished concrete:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

2. Grout-Cleaned Finish (Burlap): Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part

portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp for at least 36 hours.

3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

4. Cementitious Coating (Cement Wash): Prepare, apply and cure the coating per manufacturer's requirements. Apply in 1/16-inch thick coats not to exceed 1/8-inch.

   a. Cementitious coatings are finished coatings and not to be used as patching or repair materials. Cement-sand-water mix is not cementitious coatings as defined under paragraph 2.11.E. Under no circumstances will products containing gypsum plaster be allowed as a cementitious coating.

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

3.12 FINISHING FLOORS AND SLABS

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

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes.

   1. Apply scratch finish to surfaces indicated and to surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

   1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.

2. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155/E 1155M for a randomly trafficked floor surface:

   a. Specified overall values of flatness, F(F) 25; and levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and levelness, F(L) 15.

   b. Specified overall values of flatness, F(F) 35; and levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and levelness, F(L) 17; for slabs-on-grade.

   c. Specified overall values of flatness, F(F) 30; and levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and levelness, F(L) 15; for suspended slabs.

   d. Specified overall values of flatness, F(F) 45; and levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and levelness, F(L) 24.

3. Finish and measure surface so gap at any point between concrete surface and an unleveled freestanding 10-foot-long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed the following: 1/8 inch.

E. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

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

G. Swirled Finish: Apply a swirl finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated. Immediately after second troweling, and when concrete is still plastic, work the surface with a float in semi-circular or fan-like motion.

H. Slip-Resistive Aggregate Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:

1. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive aggregate over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.

2. After broadcasting and tamping, apply float finish.

3. After curing, lightly work surface with a steel wire brush or an abrasive stone, and water to expose slip-resistive aggregate.

I. Unpigmented Mineral Dry-Shake Floor Hardener Finish: After initial floating, apply mineral dry-shake materials to surfaces according to manufacturer's written instructions and as follows:

1. Uniformly apply mineral dry-shake materials at a rate of 100 lb/100 sq. ft., unless greater amount is recommended by manufacturer.

2. Uniformly distribute approximately two-thirds of mineral dry-shake materials over surface by hand or with mechanical spreader, and embed by power floating. Follow power floating with a second mineral dry-shake application, uniformly distributing remainder of material, and embed by power floating.

3. After final floating, apply a trowel finish. Cure concrete with curing compound recommended by dry-shake material manufacturer and apply immediately after final finishing.

J. Color Finish (Pigmented Mineral Dry-Shake Floor Hardener): Prior to color application, manufacturer's representative shall instruct finisher on application and curing requirements of Color Floor Hardener and be present during application. After initial floating, apply mineral dry-shake materials to surfaces according to manufacturer's written instructions and as follows:

1. Uniformly apply mineral dry-shake materials at a rate of 100 lb/100 sq. ft., unless greater amount is recommended by manufacturer. Do not cast material into standing water.

2. Uniformly distribute approximately two-thirds of mineral dry-shake materials over surface by hand or with mechanical spreader, and embed by power floating. Follow power floating with a second mineral dry-shake application at right angles to first application, uniformly distributing remainder of material, and embed by power floating.

3. After final floating, apply a trowel finish. Take care not to over trowel and "burn" the surface. Cure concrete with curing compound recommended by dry-shake material manufacturer and apply immediately after final finishing.

3.13 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as

specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

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

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

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

E. Electrical Work: Use 3/4" maximum size of aggregates for duct encasement. Unless detailed otherwise, encase underground ducts or conduits as follows:

1. Provide 3 inches minimum concrete cover around ducts or conduits. Use spacers to place and hold ducts. Provide 18 inches minimum earth cover over top of concrete encasement unless otherwise detailed.

2. For future connections, provide a one foot section of ducts or conduits to extend beyond concrete encasement and terminate with a coupling or end cap.

F. Concrete for Drainage, Sewer and Plumbing Systems:

1. Do not use calcareous coarse aggregates in sewerage structures or components.

2. Unless specified elsewhere, construct sewer manholes in accordance with the latest adopted/amended edition of Section 23 SEWER MANHOLES of the “STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION”.

3.14 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces before and during finishing operations. Apply according to manufacturer’s written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the curing methods listed in paragraph 3.14.D.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

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

   a. Moist cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.

   b. Moist cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.

   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.

3. Curing Compound: Apply uniformly in continuous operation by spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application where recommended by the manufacturer. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.15 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.

2. Do not apply to concrete that is less than 14 days old. Also verify and comply with manufacturer's recommendations.

3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; re-wet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

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

3.16 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions. Defer joint filling as long as possible. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid epoxy joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.17 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas. Remove and replace concrete that cannot be repaired and patched to DAGS Representative's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16(1.2-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect's Representative.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4-inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1-inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1-inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's Representative's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to DAGS Representative's approval.

3.18 DRYING CONCRETE SLABS TO LIMIT MOISTURE VAPOR EMISSIONS AND ALKALINITY

A. For concrete slabs (on grade or suspended) receiving floor finish susceptible to vapor emissions, protect, dry or seal concrete slabs to meet the required vapor emission level(s) of the intended floor finish systems. If choosing to use a floor sealing system, furnish submittals for approval.

1. Once slab drying has started, protect it from getting wet prior to floor finish installation. Test floor for moisture and alkalinity in accordance with Section 01450, Quality Requirements.

2. Test floor for vapor emission at locations and quantities recommended by the test kit manufacturer. Test pH levels of Concrete and humidity per ASTM F 2170.

3. If the concrete slab does not meet the vapor emission or alkalinity level(s), use other means such as mechanical drying or floor sealing system(s) (penetrants, coatings, or membranes) to achieve the required levels.

4. If the concrete floor slab does not meet the required alkalinity level, neutralize, cure, dry or seal concrete to bring the concrete to an acceptable alkalinity level.

5. Be aware that no additional time or costs will be granted to meet the required vapor emission levels or alkalinity levels of the concrete surfaces.

B. Floor Vapor Emission Control System:

1. Acceptable products: Subject to compliance with requirements, products that may be incorporated into the Work include the following. Other products must be specifically approved by the Architect for use in this project.

a. Floor Seal by Floor Seal Technology, Inc.

b. Vectr-R System by Sinak Corporation.

2. Install per manufacturer's requirements to achieve a guaranteed vapor emission rate that meets the finished flooring recommended rates. Treatment shall not provide detrimental conditions to the concrete slab or floor covering materials. Make sure flooring adhesives are compatible with the treatment materials.

3. Installer shall provide proof of installer's certification by the treatment manufacturer.

4. Guarantee

a. Manufacture's Guarantee: Warrant against bond failure with concrete and failure of the system due to vapor emission and alkalinity levels.

b. Project Guarantee: Replace original finished flooring materials and vapor emission control system due to failure of the vapor emission control system to control vapor emission and prevent unacceptable alkalinity levels. Provide extended warranty that is covered by a separate material and installation bond or by the manufacturer's product liability insurance policy specifically covering the work on this Project. DAGS shall have final approval of accepting the bond or manufacturer's insurance policy.

c. Guarantee Period: Ten (10) years.

3.19 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.

2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.

4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F4.4 deg C and below and when 80 deg F (27 degC) and above, and one test for each composite sample.

5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.

6. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.

   a. Cast and field cure one set of four standard cylinder specimens for each composite sample.

7. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days and two at 28 days.

   a. Test two field-cured specimens at 7 days and two at 28 days.

b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.

C. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

D. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi3.4 MPa.

E. Test results shall be reported in writing to DAGS Representative, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.

F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect's Representative but will not be used as sole basis for approval or rejection of concrete.

G. Moisture Vapor Emission Test: Standard test method meeting ASTM F 1869.

H. Alkalinity (pH Level) Testing: Standard test required for floor slabs and all wall and ceiling surfaces to receive painted finishes. Testing of concrete to receive paint finish may be conducted under Painting Section.

I. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect's Representative. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect's Representative.

END OF SECTION 03300

August 16, 2021

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

As specified in Section 00700.

1.02 GENERAL REQUIREMENTS

A. The extent of structural steel work is shown on the drawings, including schedules, notes and details to show size and location of members, typical connections and type of steel required.

B. Structural steel is that work defined in the AISC "Code of Standard Practice" and as otherwise shown on the drawings.

1.03 QUALITY ASSURANCE

A. Codes and Standards: Comply with the provisions of the following except as otherwise indicated:

1. AISC "Code of Standard Practice for Steel Buildings and Bridges".

2. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings" and including the "Commentary" and Supplements thereto as issued.

3. AWS D1.1 "Structural Welding Code".

4. ASTM A6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".

5. AISI SG-673 "Specifications for the Design of cold formed steel Structural Members".

6. ASTM A 123, "Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products".

7. ASTM A 153, "Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware".

B. Qualifications for Welding Work:

1. Qualify welding processes and welding operators in accordance with the AWS "Standard Qualification Procedure".

2. Provide certification that welders to be employed in the work have satisfactorily passed AWS qualification tests within the previous 12 months. If re-certification of welders is required, retesting will be the Contractor's responsibility.

C. Source Quality Control:

1. Materials and fabrication procedures are subject to inspection and tests in the mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve the Contractor or responsibility for providing materials and fabrication procedures in compliance with specified requirements.

2. Promptly remove and replace materials or fabricated components which do not comply.

D. Design of Members and Connections:

1. All details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at the site whenever possible without causing delay in the work.

2. Promptly notify the Engineer whenever design of members and connections for any portion of the structure are not clearly indicated.

1.04 SUBMITTALS

A. Shop Drawings, Structural Steel:

1. Submit shop drawings including complete details and schedules for fabrication and shop assembly of members, and details, schedules, procedures and diagrams showing the sequence of erection.

2. Engineer's review of shop drawings will be for general considerations only. Compliance with requirements for materials fabrication and erection of structural steel is the Contractor's responsibility.

a. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols, and show size, length, and type of each weld.

b. Provide setting drawings, templates, and directions for the installation of anchor bolts and other anchorages to be installed by others.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site at such intervals to insure uninterrupted progress of the work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay that work.

B. Store materials to permit easy access for inspection and identification. Keep steel members off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration. Do not store materials on the structure in a manner that might cause distortion or damage to the members or the supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Asbestos Prohibition: No asbestos containing materials or equipment shall be used under this section. The Contractor shall ensure that all materials and equipment incorporated in the project are asbestos-free.

B. Structural Steel Tubing: ASTM A 500, Grade B, galvanized.

C. Steel Pipe: ASTM A 53, Grade B, Schedule 40, galvanized.

D. Rolled Steel Plates, Shapes and Bars: ASTM A 36, hot dipped galvanized, except where other type steel is shown.

E. Anchor Bolts: ASTM A 36, regular hexagon type bolts, galvanized.

F. Unfinished Bolts and Nuts: Shall conform to ASTM Standard A 307 and shall be the regular hexagon-bolt type, galvanized.

G. Washers: Round washers shall conform to Fed. Spec. FF-W-92. Washers shall be galvanized.

H. Electrodes for Welding: Comply with AWS Code. Use E70XX electrodes.

I. Galvanizing: Provide hot-dip galvanize coating for all steel as follows:

1. ASTM A 153 for galvanizing iron and steel hardware.

2. ASTM A 123 for galvanized rolled, pressed and forged steel shapes, plates, bars and strip 1/8" thick and heavier.

J. Galvanizing Repairs Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, complying with the Military Specifications DOD-P-21035 (ships) or SSPC-Painting-20.

K. Cement Grout Portland Cement (ASTM C 150, Type I or Type III) and clean, uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with only the minimum amount of water required for placement and hydration.

L. Composite Floor Deck: Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel

Floor Deck," in SDI Publication No. 30, with the minimum section properties indicated, and with the following:

1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G90 zinc coating.

2. Profile Depth: 1-1/2 inches deep x 20 gage, with minimum Moment of Interia of 0.222 in^4 ,Section Modulus of 0.235 in^3.

2.02 FABRICATION

A. Shop Fabrication and Assembly:

1. Fabricate and assemble structural assemblies in the shop to the greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on the final shop drawings. Provide camber in structural members as shown.

2. Property mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

3. Where finishing is required, complete the assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in the finals structure free of markings, burrs, and other defects.

B. Connections:

1. Weld shop connections, as indicated.

2. Bolt field connections, except where welded connections or other connections are indicated. Provide unfinished threaded fasteners for only the bolted connections or secondary framing members to primary members (including purlins, girts and other framing members taking only nominal stresses) and for temporary bracing to facilitate erections.

3. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work. Grind welds smooth where exposed as at welded steel column covers and forms.

2.03 SHOP PAINTING

NONE

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2.04 GALVANIZING

Steel components shall be hot-dip galvanized in accordance with ASTM A 123 and A 153, as applicable. Steel components, including nuts, bolts, washers, etc. which are small enough for hot-dip galvanizing shall be treated.

PART 3 - EXECUTION

3.01 INSPECTION

Examine the areas and conditions under which structural steel work is to be installed, and notify the Engineer in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Erector.

3.02 ERECTION

A. General: Comply with the AISC Specifications and Code of Standard Practice, and as herein specified.

B. Surveys: Provide services of a registered surveyor to establish permanent bench marks, check lines and elevations of concrete and masonry bearing surfaces, and locations of anchored bolts and similar devices before steel erection proceeds. Discrepancies will be reported immediately to the Engineer. Do not proceed with erection until corrections have been made, or until compensating adjustments to the structural steel work have been agreed upon with the Engineer.

C. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to be imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of the structures as erection proceeds.

D. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete the work.

E. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.

1. Furnish templates and other devices as necessary to presetting bolts and other anchors to accurate locations.

2. Refer to Division 3 of these specifications for anchor bolt installation requirements in concrete, and Division 4 for masonry installation.

F. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean the bottom surface of base and bearing plates.

1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.

2. Tighten the anchor bolts after the supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the base or bearing plate prior to packing with grout.

3. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure in strict compliance with the manufacturer's instructions, or as otherwise required.

G. Field Assembly: Set structural frames accurately to the lines and elevations indicated. Align and adjust the various members forming a part of a complete frame or structure before permanently fastening. clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of the structure within specified AISC tolerances.

2. Splice members only where shown or specified.

H. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds, grind smooth at exposed surfaces.

I. Comply with ASIC Specifications for bearing, adequacy of temporary connections, alignment, and the removal of paint on surfaces adjacent to field welds. Do not enlarge unfair holes in members by burning or by the use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

J. Gas Cutting: Do not use gas cutting torches in the field for correcting fabrication errors in the structural framing. Cutting will be permitted only on secondary member which are not under stress, as acceptable to the Engineer. Finish gas-cut sections equal to a sheared appearance when permitted.

K. Touch-up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of the shop paint. Apply paint to exposed areas with the same materials as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

3.03 FIELD QUALITY CONTROL

Correct deficiencies in structural steel work which inspections have indicated to be not in compliance with requirements. Perform additional tests at Contractor's expense, as may be necessary to reconfirm any non-compliance of the original work, and as may be necessary to show compliance of corrected work.

END OF SECTION

SECTION 05500 – METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Metal fabrications include items made from iron and steel plates, bars, strips, tubes, pipes and castings which are not a part of structural steel or other metal systems specified elsewhere.

B. Extent of metal fabrications is indicated on drawings and schedules.

C. Types of work in this section include metal fabrications for:

1. Rough hardware.
2. Miscellaneous framing and supports.
3. Countertop support brackets

D. Related Work Described Elsewhere:

1. Section 06415 – SOLID SURFACE MATERIAL COUNTERTOPS

1.02 QUALITY ASSURANCE

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.03 SUBMITTALS

A. General: Submit under provisions of Section 01330 – SUBMITTAL PROCEDURES.

B. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products.

C. Shop Drawings: Submit shop drawings for fabrication and erection of miscellaneous metal fabrications. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others.

D. Where materials or fabrications are indicated to comply with certain requirements for design loadings include structural computations, material properties and other information needed for structural analysis.

E. Samples: Submit 2 sets of representative samples of railing materials and finished products as may be requested by Architect.

1.04 WARRANTY

A. Manufacturer’s Warranty (Countertop Bracket): Submit manufacturers written warranty agreeing to repair or replace brackets that fail in materials or workmanship during the warranty period.

1. Warranty Period: Lifetime.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Asbestos Prohibition: No asbestos containing materials or equipment shall be used in this section. The Contractor shall ensure that all materials and equipment incorporated in the project are asbestos-free.

B. Ferrous Metals:

1. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

2. Structural Steel Plates, Channels, Angles and Bars: ASTM A 36/A 36M.

3. Welding Rods and Bare Electrodes: Select according to AWS specification for the metal alloy to be welded.

C. Aluminum: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.

1. Aluminum Plate: ASTM B 209, Alloy5052-H32.

2. Extruded Bars and Shapes: ASTM B 221, Alloy 6063-T5/T52

D. Fasteners:

1. Any fasteners in wet or exposed areas of the wall shall be series 300, non-magnetic stainless steel. All other fasteners shall be hot-dipped galvanized unless otherwise noted.

a. Use types, gages, and lengths to suit unit installation conditions.

b. Use Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

2. Exposed Fasteners: Where indicated or required provide flat-head fasteners with exposed heads finished to match exposed aluminum components.

a. Provide fasteners with tamper-resistant heads.

3. Screws: ANSI B18.2.1, ANSI B18.6.2, and ANSI B18.6.3.

4. Plain Washers: Round, carbon steel, ANSI B18.22.1, except where specified of stainless steel.

5. Threaded Concrete and Masonry Anchors:

a. Material and Finish: Bi-Metal, 300 Series Stainless Steel head and shank fused to harden steel tapping threads and point with corrosion resistant coating with not less than 800 hours of salt-spray resistance according to ASTM B 117.

b. Basis of Design: Elco Industries, Inc.; Aggre-Gator; Hex Washer Head with Silver Stalgard finish.

c. Not Acceptable: Self-drilling fasteners, screw in plugs, and powder actuated fasteners are not permitted in concrete

6. Toggle Bolts: ANSI B18.2.1 as required.

7. Lock Washers: Helical spring type carbon steel, ANSI B18.21.1.

E. Miscellaneous Steel Backing Plates: Provide adequate steel backing plates as required by architectural and mechanical drawings for the attachment of items such as fixtures, toilets, sinks, railings, equipment, and other items. Securely fasten all plates in precise position to supporting members.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187

2.02 FABRICATION, GENERAL

A. Workmanship: Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of work.

B. Fabricate metal fabrications to design, dimensions and details shown. Provide members in sizes and profiles indicated, with supporting members and brackets of size and spacing shown, but not less than required to comply with requirements indicated for structural performance and delegated structural analysis

C. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32-inch unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Welded Connections: Use welding method which is appropriate for metal and finish indicated and that develops strength required to comply with structural performance criteria. Finish exposed welds and surfaces complying with NOMMA Joint Finishes; “Finish #1 – No Evidence of Welded Joint”. Weld all around at connections, including at fittings. Perform welded connections prior to finishing.

E. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flathead (countersunk) screws or bolts.

F. Provide for anchorage of type shown, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

G. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.

H. Galvanizing: Provide a zinc coating for those items shown or specified to be galvanized, as follows:

1. ASTM A 153 for galvanizing iron and steel hardware.

2. ASTM A 123 for galvanizing rolled, pressed an forged steel shapes, plates, bars and strip 1/8-inch thick and heavier, and for assembled steel products.

3. Coating thickness shall be not less than G90 designation.

I. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

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

1. Exteriors (SSPC Zone 1B): SSPC-SP6 'Commercial Blast Cleaning".

2. Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning".

2.03 ROUGH HARDWARE

A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting metal fabrications.

B. Fabricate items of sizes, shapes and dimensions required. Furnish steel washers.

2.04 MISCELLANEOUS FRAMING AND SUPPORTS

A. Provide miscellaneous steel framing and supports which are not a part of structural steel framework reinforcement, and other members as required to complete work.

B. Fabricate miscellaneous units to sizes, shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise shown, fabricate from structural steel shapes, plates, and steel bars, for supports, of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.

C. Galvanize all miscellaneous frames and supports.

2.05 COUNTERTOP SUPPORT BRACKETS

A. Provide pre-engineered, steel angle brackets for floating countertop support with steel outrigger plate welded to steel vertical tang, predrilled for fastening to wood studs.

1. Basis of Design Product: The design is based upon steel countertop brackets as manufactured by The Original Granite Bracket. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

a. Centerline Brackets

b. Iron Supports.com

c. Or approved equal.

2. Size:

a. Horizontal Support Plate: 1/2-inch thick by 2-1/2-inches wide by length require to support countertop of depth indicated on the Drawings.

b. Vertical Tang: 1/4-inch thick by 2-1/2-inch wide by 11-inches in length with six (6) pre-drilled 1/4-inch diameter holes for fasteners.

3. Finish: Manufacturer's factory applied TGIC polyester powder coating or corrosion-resistant, oil modified alkyd enamel paint.

a. Color: Flat Black.

PART 3 - EXECUTION

3.01 PREPARATION

A. Examine the areas and conditions under which metal fabrications will be installed and correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected and approved by the Architect.

B. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible, do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.

C. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.02 INSTALLATION , GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts, and other connectors as required.

B. All welding shall be done by skilled mechanics qualified or licensed in accordance with local building regulations and shall conform to the recommended practices of the American Welding Society. All welds or damage to structural steel coating must be prepared and touched up with zinc rich primer as described herein.

C. Do not weld or abrade surfaces of components that have been coated or finished after fabrication and are intended for field connection by mechanical or other means without further cutting or fitting

D. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete masonry or similar construction.

E. Fit exposed connections accurately together to form tight hairline joints.

F. Align screen and awning units so that variations from level for horizontal members, parallel for aligned members shall not exceed 1/8-inch in 12-feet.

G. Repair finishes damaged by cutting, welding, soldering, and grinding operations required for fitting and jointing. Restore finishes so there is no evidence of corrective work. Return items which cannot be refinished in field to shop, make required alterations and refinish entire unit, or provide new units

H. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.03 CONNECTIONS

A. Nonwelded Connections: Use manufacturer's standard mechanical joints for permanently connecting components. Use wood blocks and padding to prevent damage to screen and awning members and fittings. Seal recessed holes of exposed locking screws using plastic filler cement colored to match finish of the screen and awning.

B. Welded Connections: Use welding method which is appropriate for metal and finish indicated and that develops strength required to comply with structural performance criteria. Finish exposed welds and surfaces smooth, flush, and blended to match adjoining surfaces complying with NOMMA Joint Finishes; “Finish #1 – No Evidence of Welded Joint”. Weld all around at connections, including at fittings. Cope or butt components to provide 100 percent contact or use manufacturer's standard fittings designed for this purpose.

3.04 INSTALLING COUNTERTOP SHELF BRACKETS

A. Install countertop bracket in accordance with the manufacturer’s installation instructions and the coordinated countertop shop drawings required in Section 06415 – SOLID SURFACE MATERIAL COUNTERTOPS.

B. Coordinate positioning and heights for installed bracket to achieve the required countertop elevations call for in the Drawings. Mark the appropriate height for the bracket on the studs.

C. Position the bracket to line up with the mark and set a level on the support plate arm to ensure it is level. Pre-drill fastener holes in the stud frame and fasten bracket in place with wood screws provided by the bracket manufacturer.

D. Check to see that all the brackets for the section of countertop all line up level and plumb. Adjust brackets as necessary to ensure a level countertop installation at the height required by the approved countertop shop drawings.

E. Install countertops per Section 06415 – SOLID SURFACE MATERIAL COUNTERTOPS.

3.05 ADJUST AND CLEAN

A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. For Galvanized Surfaces: Clean field welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION

DIVISION 6 - WOOD AND PLASTICS

SECTION 06070 - WOOD TREATMENT

PART 1- GENERAL

1.01 SUMMARY

A. Plant preservative, insecticide and fire-retardant treatment of lumber and other wood products specified in other Sections of this Specification by pressure methods.

B. Field treatment of field cut or drilled lumber.

1.02 RELATED SECTIONS

A. SECTION 06100 - ROUGH CARPENTRY: Lumber products needed to receive preservative, insecticide and fire-retardant treatment of lumber products.

1.03 REFERENCES

A. American Wood-Preservers' Association

1. AWPA P5: Standard for Waterborne Preservatives.
2. AWPA P9: Standards for Solvents and Formulations for Organic Preservative Systems.
3. AWPA U1: Use Category System: User Specification for Treated Wood.
4. AWPA T1: Use Category System: Processing and Treatment Standard
5. AWPA M4: Care of Preservative-Treated Wood Products.

1.04 SUBMITTALS

A. Submit in accordance with SECTION 01330 – SUBMITTALS.

B. Product Data: Provide data on all treatment products, including field application instructions if applicable.

1. Provide manufacturer's Material Safety Data Sheets on all products, and hazardous materials.

C. Preserver Certifications:

1. Provide a Certificate of Treatment showing compliance with these specifications for the following:

a. Kiln drying.

b. Method of treatment performed, including dip treatment.

D. Contractor's Certification: Provide a certification letter stating that all wood used on this job including cuts and penetration were treated and coated with preservatives in compliance with requirements of this contract.

E. Warranty: Submit written warranty as specified in paragraph entitled "WARRANTY" hereinbelow.

1.05 REGULATORY REQUIREMENTS

A. Comply with State OSHL (Occupancy Safety and Health Law) and pollution controls regulations of the State Department of Health and EPA.

1.06 QUALITY ASSURANCE

A. Treatment methods shall be approved by ICBO. Preservatives shall be EPA registered.

B. Do not use preservatives containing arsenic or other EPA banned chemicals.

C. Do not use Perma-Clear 65 or other zinc napthanate and permethrin products.

1.07 DELIVERY STORAGE AND HANDLING

A. Protect AWPA C31 inorganic boron treated wood from contact with the ground, rain or other sources of liquid water until permanent installation of covering construction.

1.08 WARRANTY

A. The Contractor shall issue to HHSC a written warranty that he will replace all treated wood used in the newly renovated portions of the building which is attacked by subterranean termites within a period of five years from the date of Substantial Completion(unless a longer period of time is standard with the manufacturer) up to a total cost of $5,000.00 (unless higher amount standard with the manufacturer) or is attacked by dry wood termites or deteriorates due to dry rot within the first five years of the date of Substantial Completion.

B. Fire-Treated Lumber Warranty: Provide Manufacturer's warranty agreement warranting that the fire-treated lumber and plywood will not fail structurally due to heat degradation and high humidity for a period of 30 years commencing from the date of Substantial Completion.

PART 2- PRODUCTS

2.01 GENERAL

A. Mill lumber to finish size and shape prior to treating and treat before assembly. Plywood may be treated in regular panel sizes.

B. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece, or omit marking and provide certificates of treatment compliance issued by inspection agency.

2.02 PRESSURE TREATMENT WITH WATER-BORNE PRESERVATIVES

A. Treating Solutions:

1. Copper azole, Type C (CA-C).

2. Inorganic boron (SBX).

B. Treatment Methods:

1. General:

a. All water-borne treatment methods require incising of lumber of nominal 2-inch thickness (1-1/2 inches actual dimension).

b. Choice of treatment method and conditions of use of each treating solution shall conform to the treatment schedule contained in Part 3.

2. Copper Azole, CA-C: Treatment methods, depth of penetration and treating solution retention shall conform to AWPA U1.

3. SBX: Treatment method shall conform to AWPA U1. Treating solution retention shall be a minimum of 0.28 pounds per cubic foot (equivalent to 0.42 DOT).

C. Drying:

1. Before Treatment:

a. CA-C Treatment: Wood shall be air dried or kiln-dried before treatment to an average moisture content of 28 percent or less per AWPA standards.

b. SBX Treatment: Wood having a moisture content higher than 28 percent is acceptable when treating with SBX.

2. After Treatment: All one-inch and 2-inch lumber and all plywood shall be dried to a moisture content of 19 percent or less after treatment.

2.03 PRESSURE TREATMENT WITH OIL-BORNE PRESERVATIVES

A. Treating Solution:

1. 0.50 percent by weight chlorpyrifos, 0.75 percent by weight 3-iodo-2-propynyl butyl carbamate (IPBC). The solvent used in formulating the preservative solution shall meet the requirements of AWPA hydrocarbon solvent Type C, Standard P9, Paragraph 3.1.

2. For interior application use low odor mineral spirits as solvent.

B. Treatment Methods: Treated wood shall attain the following net retention requirements: 0.0175 pounds of Chlorpyrifos per cubic foot of wood, 0.035 pound of 3-Iodo-2 propynyl butyl carbamate per cubic foot of wood.

C. Drying:

1. Before Treatment: All wood treated with oil-borne preservatives shall be kiln-dried to an average moisture content of 12 percent to 15 percent per AWPA standards.

2. After Treatment: Wood shall be thoroughly dried and virtually odor-free prior to installation.

2.04 FIRE RETARDANT TREATMENT

A. Fire retardant preservative for interior use shall be DRICON FRT as manufactured by Koppers Company, Inc., FirePro HT by Osmose Wood Preserving Company, Inc., Protex by Hoover Universal Wood Preserving Division, or approved equal.

1. Preservative must be certified as resistant to attack by termites, rot, corrosiveness, and hydroscopicity.
2. Preservative shall comply with the requirements of UL 723, ASTM E 84, NFPA 255.
3. Moisture content shall be in accordance with the following:
    a. Lumber and Plywood: AWPA Standard U1 “Commodity Specification H - Fire Retardants”.

B. Wood at exterior locations shall be FRX fire retardant treated wood for exterior applications.
1. Fire performance rating as determined in ASTM E 84 tunnel test.
2. Lumber and Plywood: Species Douglas-Fir, Flame spread 15, smoke developed 0

2.05 FIELD TREATMENT

A. Treatment Method: Treat in accordance with AWPA Standard M4 using two heavy brush coats of a treating solution.

PART 3 – EXECUTION

3.01 SCHEDULE OF TREATMENTS

A. Species:
1. Treat all wood species except all-heart redwood.
2. All water-borne and oil-borne treatment solutions are applicable to douglas-fir and hem-fir species except for CA-C treatment which is acceptable for hem-fir species only.

B. Application:
1. Pressure Treatment:
    a. General: Unless otherwise stipulated, all lumber and plywood shall be pressure treated.
    b. Exposed-to-View lumber 1-1/2 inch (net thickness) and over that will be unpainted or receive a clear finish shall be and pressure treated with oil-borne preservative. Do not incise lumber.
    c. SBX treated wood shall not be used in areas exposed to direct precipitation unless painted or covered with a finish material. Lumber used in areas exposed to direct precipitation not scheduled for painting or clear finish shall be treated with CA-C.
2. Fire Retardant Treatment
    a. All lumber and plywood as required by Code or specifically indicated in the Contract Documents shall be treated with fire retardant preservative in accordance with AWPA Standard U1 “Commodity Specification H - Fire Retardants”. Pressure impregnate with fire retardant chemicals to meet the follow criteria:
        i. Flame Spread Rating: 25 or less; UL 723, ASTM E 84, or NFPA 225

ii. Finished product must be stainable and paintable adversely affect bond or color of final finish.

b. Each piece of fire-retardant treated lumber or plywood shall be provided with a UL label. Material to be used in exposed finish work shall be labeled with a pressure sensitive tag or otherwise identified as fire-retardant treated material. Do not mark or stamp material to be exposed in the finish work

3. Field Cuts: Treat end cuts, notches and penetrations into treated lumber or plywood. Exception: Cuts and penetrations made in SBX treated wood 2-inches or less in nominal thickness need not be field treated.

END OF SECTION

SECTION 06100 - ROUGH CARPENTRY

PART 1 – GENERAL

1.01 SUMMARY

A. Work Includes:

1. Wood furring, grounds, nailers and blocking.
2. Plywood Sheathing
3. Metal framing anchors.

B. Related Work Described Elsewhere:

1. Section 06070 – WOOD TREATMENT
2. Section 06400 – ARCHITECTURAL CASEWORK

1.02 REFERENCES

A. American Plywood Association's "Design/Construction Guide, Residential and Commercial" (APA).

B. U.S. Department of Commerce, National Institute of Standards and Technology.

PS 1 - US Product Standard for Construction and Industrial Plywood.

PS 2 - Performance Standard for Wood-Based Structural-Use Panels.

PS 20 - American Softwood Lumber Standard (ASLS).

C. American Society for Testing and Materials (ASTM).

D. American Wood Preservers' Association's Standards (AWPA).

E. International Building Code, 2012 Edition (IBC) with Kauai County Amendments.

1.03 DEFINITIONS

A. Rough carpentry: Carpentry work not specified in other sections and not exposed, unless otherwise indicated.

B. Exposed framing: Dimension lumber not concealed by other construction and indicated to receive a transparent finish.

1.04 SUBMITTALS

A. Submit the following:

1. Product data and ICBO evaluation reports: Engineered wood products, underlayments, insulating sheathing, air-infiltration barriers, metal framing anchors, and construction adhesives.
2. Material certificates: Dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use, and design values approved by American Lumber Standard's Committee, ALSC, Board of Review.

3. Material test reports: Compliance of fire-retardant-treated wood with indicated requirements.

1.05 QUALITY ASSURANCE

A. Single-source responsibility:

1. Engineered wood products: Obtain each type of product from one source and by a single manufacturer.

2. Fire-retardant-treated wood products: Obtain each type of product from one source and by a single manufacturer.

B. Wood products: Bear grade stamp or trade mark as follows.

1. Dimension lumber: Grade stamped by an agency certified by the Board of Review of the American Lumber Standards Committee and manufactured in accordance with PS-20.

2. Plywood: Trademark of the American Plywood Association.

1.06 DELIVERY, STORAGE AND HANDLING

A. Observe manufacturer's instructions and precautions for the safe transportation, storage and handling of potentially harmful or hazardous materials.

B. Keep materials under cover and dry.

1. Protect from weather and contact with damp or wet surfaces.

2. Stack lumber, plywood and other panels; place spacers between each bundle to provide air circulation.

3. Provide for air circulation around stacks and under temporary coverings.

C. Pressure treated lumber and plywood: Place spacers between each bundle to provide air circulation.

PART 2 - PRODUCTS

2.01 LUMBER

A. General:

1. Asbestos Prohibition: No asbestos containing materials or equipment shall be used in this section. The Contractor shall ensure that all materials and equipment incorporated in the project are asbestos-free.

2. Lumber standards: Comply with PS 20 and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

a. WCLIB: West Coast Lumber Inspection Bureau.
b. WWPA: Western Wood Products Association.

3. Grade stamps:

a. Factory-mark each piece of lumber with grade stamp of inspection agency.

b. Exposed lumber: Apply grade stamps to ends or back of each piece of exposed lumber, or omit grade stamps and issue certificate of grade compliance from inspection agency.

4. Dimensions:

a. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

b. Provide dressed lumber, S4S, unless otherwise indicated.

5. Seasoning: Uniformly 15 percent maximum moisture content at time of dressing and shipment for sizes 2" or less in nominal thickness, unless otherwise indicated.

B. Miscellaneous Lumber:

1. Wood for support or attachment of other work including cant strips, bucks, nailers, blocking, furring, grounds, stripping and similar members shall be fire-retardant treated as specified in Section 06070 – WOOD TREATMENT.

2. Grade and Species: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common or Standard grade per WWPA of any species.

2.02 PLYWOOD

A. Standards: Comply with U.S. Product Standard PS 1 for plywood panels. Comply with APA "Performance Standard and Policies for Structural-Use Panels" for products not manufactured under PS 1. Factory-mark each construction panel with APA.

B. Manufacture plywood panels with an exterior-type adhesive complying with ASTM D 2559 and containing no urea formaldehyde.

C. Performance-rated panels: APA Performance-Rated Panels complying with indicated requirements where used for the following concealed applications.

1. Countertop Substrate: APA 3/4-inch, A-C Exterior Grade, 4-foot by 8-foot plywood.

2. Backing Panels: APA 5/8-inch, A-C Exterior Grade, 4-foot by 8-foot plywood. Treat with fire retardant treatment as specified in Section 06070 – WOOD TREATMENT.

2.03 FASTENERS

A. General: Provide fasteners of size and type indicated, that comply with requirements specified.

Where rough carpentry work is exposed to weather, in ground contact, or in areas of high relative humidity, provide fasteners with hot-dip, zinc-coating per ASTM A153

B. Nails, Wire, Brads, and Staples: FS FF-N-105B.

C. Wood Screws: ASME B18.6.1.

D. Lag Bolts: ASME B18.2.1.

E. Bolts: Steel bolts complying with ASTM A307, Grade A with ASTM A563 hex nuts and, where indicated, flat washers.

2.04 METAL FRAMING ANCHORS

A. General: Provide galvanized steel framing anchors of structural capacity, type, and size indicated, with allowable design loads as published by manufacturer that meet or exceed those indicated.

B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653, G60 coating designation; structural, commercial, or lock-forming quality, as standard with manufacturer for type of anchor indicated.

2.05 MISCELLANEOUS MATERIALS

A. Building Paper: ASTM D 226, Type I, asphalt saturated felt, non-perforated, 30-lb type.

B. Construction Adhesive: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59 subport D (EPA METHOD 24).

PART 3 – EXECUTION

3.01 INSPECTION

A. Examine areas to receive rough carpentry work and verify following:

1. Complete installation of building components to receive rough carpentry work.

2. That surfaces are satisfactory to receive work.

3. That spacing, direction, and details of supports are correct to accommodate installation of blocking, backing, stripping, furring, and nailers.

3.02 INSTALLATION

A. General:

1. Discard material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.

2. Set carpentry work to required levels and lines, with members plumb and true to line and cut and fitted.

3. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

4. Apply field treatment complying with AWPA M4 to cut surfaces of

preservative-treated lumber and plywood

5. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by the following:
   a. IBC Table 2304.9.1, “Fastening Schedule.”
   b. Published requirements of the metal framing anchor manufacturer.
   c. CABO NER-272 for power-driven fasteners.
6. Countersink nail heads on exposed carpentry work. Fill holes.
7. Use common wire nails, except as otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Predrill as required.

B. Grounds, Nailers, Blocking and Sleepers:
   1. Provide wherever shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.
   2. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

3.03 INSTALLATION OF CONSTRUCTION PANELS

A. Comply with applicable recommendations contained in "APA Design/Construction Guide - Residential & Commercial," for types of construction panels and applications indicated.

B. Fastening methods:
   1. Plywood countertop substrate: Nail to supports.
   2. Plywood backing panels: Nail or screw to supports.

3.04 PROTECTION

A. Protect rough carpentry from weather. If, despite protection, SBX treated rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

August 16, 2021

SECTION 06400 - ARCHITECTURAL CASEWORK

PART 1 -GENERAL

1.01 SUMMARY

A. Section includes:

1. Plastic Laminated Casework including:

a. Wall and Base Cabinets

2. Casework Installation.

B. Related Work Specified Elsewhere:

1. Section 06070 – WOOD TREATMENT
2. Section 06100 - ROUGH CARPENTRY - Wood blocking and concealed framing.
3. Section 06415 – SOLID SURFACE MATERIAL COUNTERTOPS

1.02 REFERENCES

A. Architectural Woodwork Standards: 2014 AWI, AWMAC, WI – "Architectural Woodwork Standards, 2ndt Edition" (AWS).

B. Department of Justice 2010 ADA Standards for Accessible Design.

1.03 SUBMITTALS

A. Shop drawings: Show location of each item, dimensioned plans and elevations, large scale details, attachment devices and other components. Show flitch matching, jointing, anchorage and accessory items. Indicate finishes.

B. Product data: For each type of product indicated including cabinet hardware and accessories, and finishing materials and processes.

C. Samples:

1. Lumber with or for transparent finish, not less than 50 sq. in., for each species and cut, finished on 1 side and 1 edge.
2. Wood veneer faced panels for transparent finish: 8" x 10", finished, for each species and cut.
3. Exposed cabinet hardware, one unit of each type and finish.
4. Cabinet liner.

1.04 QUALITY ASSURANCE

A. Architectural Woodwork Standards: Unless otherwise indicated, comply 2014 AWI, AWMAC, WI – "Architectural Woodwork Standards, 2nd Edition" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

B. Grading Marks: Factory mark each piece of lumber and plywood with type,

grade, mill, and grading agency identification. Certificate of inspection and grading by a recognized agency may be submitted with each shipment in lieu of factory marking, at Contractor's option.

C. Softwood Lumber Standards: Comply with U.S. Department of Commerce PS 20 and with applicable grading rules of the respective grading and inspection agency for the species and product indicated.

D. Hardwood Lumber Standard: Comply with National Hardwood Lumber Association (NHLA) rules.

E. Plywood Standards: Comply with U.S. Department of Commerce PS 1 for softwood plywood; PS 51 for hardwood plywood.

F. Fabricator Qualifications: Millwork and casework specified in this section shall be produced by a custom millwork shop that employs skilled workers and that is regularly engaged in the manufacturing of similar items and with a minimum 5 year history of successful production acceptable to the Architect.

G. Installer Qualifications: Use only a firm which can demonstrate successful experience in installing items similar in type and quality to those specified for this project.

H. Regulatory Requirements: Comply with applicable provisions in 2010 ADA Standards for Accessible Design.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protect architectural woodwork with appropriate heavy duty wrapping materials prior to shipment. Mark each unit with appropriate identification required for installation.

B. Protect architectural woodwork during handling, transit and storage to prevent damage and deterioration. Store in a conditioned space complying with environmental requirements of this specification. Stack only in accordance with manufacturer's instructions.

C. Do not deliver woodwork, until painting, wet work, grinding and similar operations which could damage woodwork have been completed in installation areas.

1.06 PROJECT CONDITIONS

A. Field measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

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

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to

established dimensions.

C. Environmental requirements

1. Do not install woodwork until required temperature and relative humidity have been stabilized and will be maintained in installation areas.

2. Condition spaces for a minimum of 48 hours within occupant usage temperature and humidity ranges during the remainder of work.

1.07 COORDINATION

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

PART 2 -PRODUCTS

2.01 MATERIALS

A. Asbestos Prohibition: No asbestos containing materials or equipment shall be used in this section. The Contractor shall ensure that all materials and equipment incorporated in the project are asbestos-free.

B. Solid lumber stock: Comply with AWS Section 3 - Lumber for grading rules.

1. Softwood for concealed structures and supports: Provide kiln-dried lumber having a moisture content from time of manufacture until time of installation not greater than values required by the applicable grading rules of the respective grading and inspecting agency for the species and product indicated; Custom Grade, western pine.

C. Plywood

1. Softwood plywood for concealed structures and supports: AWS Section 4.2b, Grade A; Douglas Fir.

2. Manufacture plywood panels with an exterior-type adhesive complying with ASTM D 2559 and containing no urea formaldehyde.

D. Hardboard: AHA A135.4.

E. Moisture Resistant Medium-Density Fiberboard: ANSI A208.2, Grade MD made with binder containing no urea formaldehyde.

F. Thermoset Decorative Panels: 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.

G. Laminate for Exposed and Semi-exposed surfaces of Plastic Laminated cabinets (**PL-01**): All plastic laminates shall meet the requirements of NEMA LD 3 and ANSI A161.2 for high-pressure decorative laminates. Plastic laminate types and nominal minimum thicknesses for casework components shall comply with the following requirements:

1. Horizontal Surfaces other than Countertops: HGS Grade, 0.050-inch nominal thickness.
2. Vertical Surfaces: HGS Grade, 0.050-inch nominal thickness.
3. Edges: PVC edge banding, 0.12-inch-thick, matching laminate in color, pattern, and finish.

H. Semi-Exposed Surfaces

1. Interior surfaces of cabinets and shelves shall be HGS Grade, 0.050-inch nominal thickness where indicated.
    a. Edges: PVC edge banding, 0.12-inch-thick, matching laminate in color, pattern, and finish.
2. Drawer Sides and Backs: Thermoset decorative panels.
3. Drawer Bottoms: Hardboard.

I. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.

J. Fasteners

1. Fasteners and Anchorages: Provide nails, screws and other anchoring devices of the proper type, size, material and finish for application indicated to provide secure attachment, concealed where possible, and complying with applicable ANSI specification. Provide all fasteners and anchorages with a hot-dipped zinc coating (ASTM A 153). Fasteners at wet areas shall be stainless steel.

K. Adhesives

1. Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
2. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.

2.02 CASEWORK; PLASTIC LAMINATE

A. Quality standard: Comply with AWS Section 10 - “Casework”.

B. Plastic Laminate casework:

1. Grade: Custom grade.
2. Construction: Flush overlay.
3. Exposed surfaces: Refer to Article 2.01.E
4. Semi-Exposed Surfaces: Interior surfaces of doors, interior of cabinet and casework shall be as specified in paragraph 2.01.F.1.
    a. Drawer Sides and Backs: As specified in paragraph 2.01.F.2.
    b. Drawer Bottoms: Hardboard.

C. Laminate Color, Patterns and Finishes: Provide Laminates in colors, patterns and

finishes as scheduled (**PL-01**), or if not indicated as selected by Architect from manufacturer's full line of laminate samples.

2.03 HARDWARE

A. Shelf support pins: Provide 1/4-inch self pins with rubber cushion pads; nickel finish.

1. Hafele Shelf Support Catalog No. 282.04.739
2. Rockler Woodworking and Hardware Model # 33860.

B. Cabinet hinges: Fully concealed adjustable hinges.

1. Unless otherwise noted, all cabinet hinges shall be self-closing, full overlay and shall allow for 120 degree opening. Provide mounting plates and accessories as required.

a. Hafele Doumatic 200 Series; screw mount Catalog No. 329.03.503 or pre-approved equal.

C. Drawer Slides:

1. Full extension, concealed undermount, self-closing slides; 100 lbs. static load rating, zinc coated rolled-formed steel with shock absorbing piston.

D. Pulls: Alno Contemporary Pulls Item No. A1236-6, Polished Chrome or pre-approved equal.

E. Locks:

1. Cabinet Locks where indicated: Chrome plated keyed cam lock; Zephyr Lock, Model No. 10823-Z14.

F. ADA Compliance: Hardware on cabinets and drawers required to be accessible shall comply with Section 309.4 of the Department of Justice 2010 ADA Standards for Accessible Design.

2.04 FABRICATION

A. Cabinet Grade: Unless otherwise indicated, provide Custom-grade cabinets complying with AWS Section 10 - "Casework".

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

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

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

E. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.

F. Trial fit assemblies at fabrication shop that cannot be shipped completely

assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

1. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

G. Measurements: Obtain field measurements and verify dimensions and shop drawing details as required for accurate fit. Provide ample borders to allow for subsequent scribing and trimming for accurate fit when construction schedule does not allow time for field measurements.

2.05 CABINET FABRICATION

A. Door Construction:

1. Core: 3/4-inch medium density fiberboard.
2. Finish: High pressure plastic laminate on both faces with PVC edge banding.
    a. Interior face to match cabinet interior color.

B. Drawer Construction

1. Drawer Fronts: 3/4-inch- medium density fiberboard with high pressure plastic-laminate-on both faces and PVC edge banding.
2. Sides, back and sub-front: 1/2-inch medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1 with PVC edge banding.
3. Bottoms: 1/4-inch tempered hardboard.
4. Construction: Sides doweled and securely glued into sub-fronts and drawer backs. Sides and sub-front plowed to receive bottom. Draw face to be back screwed to sub-front from interior of drawer.

C. Cabinet End Construction:

1. Exposed and Semi-exposed Ends: 3/4-inch-thick plywood overlaid with high pressure plastic laminate with PVC edge banding.
2. Drill end panels of shelved units to receive adjustable shelf pins, two rows of 5-mm diameter holes spaced 1-1/4-inch on center.

D. Cabinet Backs,Tops and Bottoms: 3/4-inch thick plywood overlaid with high pressure plastic laminate with PVC edge banding.

E. Shelves: Plywood overlaid with high pressure plastic laminate and front edge finished with PVC banding in the following thicknesses:

1. Shelves spanning up to 30-inches: 3/4-inch thick.
2. Shelves spanning 31-inches to 42-inches: 1-inch thick.

F. Cabinet Partitions: 3/4-inch-thick plywood overlaid with high pressure plastic laminate with PVC edge banding.

1. Drill partition panels of shelved units to receive adjustable shelf pins, two rows of 5-mm diameter holes spaced 1-1/4-inch on center.

G. Cabinet Bases: Constructed from 3/4-inch-thick plywood overlaid with high pressure plastic laminate. Heights as indicated on the Drawings.

H. Filler and Soffit Panels: 3/4-inch- plywood with high pressure plastic-laminate-on both faces.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine the surfaces and conditions under which work of this section will be performed. Do not proceed until unsatisfactory conditions detrimental to timely and proper completion of the work have been corrected.

3.02 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas prior to installing.

3.03 INSTALLATION

A. Comply with AWS Section 10 - “Casework”.

1. Grade: Custom

B. Install woodwork plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level, including tops with no variations in flushness of adjoining surfaces.

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

D. Anchor woodwork to anchors or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.

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

F. Fasten each individual cabinet to floor with fasteners spaced a maximum of 24-inches on center. Fasten to walls at framing or blocking. Attachment to gypsum wallboard alone is not permitted. Where required, assemble units into one integral unit with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16-inch.

3.04 SOLID SURFACE COUNTERTOP INSTALLATION

A. For solid surface countertop installation, comply with Section 06615 – SOLID SURFACE MATERIAL COUNTERTOPS.

3.05 ADJUSTMENT, CLEANING AND PROTECTION

A. Repair damaged and defective woodwork where possible to eliminate defects functionally and visually, where not possible to repair replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate and adjust hardware.

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

D. Provide final protection and maintain conditions, in a manner acceptable to fabricator and installer, which ensures architectural woodwork being without damage or deterioration at time of Project Acceptance.

END OF SECTION

SECTION 06605 – FIBERGLASS REINFORCED WALL PANELS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Prefinished polyester glass reinforced plastic sheets with digital imaging finish and adhered to unfinished gypsum wallboard.

1. Aluminum trims.

B. Related Work Specified Elsewhere:

1. Section 09250 – GYPSUM BOARD ASSEMBLIES for gypsum board substrate.

1.02 REFERENCES

A. American Society for Testing and Materials: Standard Specifications (ASTM)

1. ASTM D 256 - Izod Impact Strengths (ft #/in)
2. ASTM D 570 - Water Absorption (%)
3. ASTM D 638 - Tensile Strengths (psi) & Tensile Modulus (psi)
4. ASTM D 790 - Flexural Strengths (psi) & Flexural Modulus (psi)
5. ASTM D 2583- Barcol Hardness
6. ASTM D 5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
7. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.03 SUBMITTALS

A. Product Data: Submit sufficient manufacturer's data to indicate compliance with these specifications, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

B. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.

C. Selection Samples: Submit manufacturer’s standard color pattern selection samples representing manufacturer's full range of available colors and patterns.

D. Samples for Verification: Submit appropriate section of panel for each finish selected indicating the color, texture, and pattern required.

1. Submit complete with specified applied finish.
2. For selected patterns show complete pattern repeat.
3. Exposed Molding and Trim: Provide samples of each type, finish, and color.

1.04 QUALITY ASSURANCE

A. Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with:

1. ASTM E 84 (Method of test for surface burning characteristics of building Materials)

a. Wall Required Rating – Class C

B. Sanitary Standards: System components and finishes to comply with:

1. United States Department of Agriculture (USDA) requirements for food preparation facilities, incidental contact.

2. Food and Drug Administration (FDA) 1999 Food Code 6-101.11.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials factory packaged on strong pallets.

B. Store panels and trim lying flat, under cover and protected from the elements. Allow panels to acclimate to room temperature (70°) for 48 hours prior to installation.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Building are to be fully enclosed prior to installation with sufficient heat (70°) and ventilation consistent with good working conditions for finish work.

B. During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of adhesive manufacturer.

1. Provide ventilation to disperse fumes during application of adhesive as recommended by the adhesive manufacturer.

1.07 WARRANTY

A. Furnish one year warranty against defects in material and workmanship commencing from the date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Induro HPL-Faced FRP as manufactured by Marlite or comparable product by one of the following:

1. Crane Composites

2. Nudo

3. Or Approved Equal

2.02 PANELS

A. Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D 5319.

1. Finishing: Custom pattern and color, match PL-01, see Drawings.
2. Dimensions:
   a. Thickness: 0.090 - inch nominal
   b. Width: 4 – feet nominal
   c. Length: 8 – feet nominal
3. Tolerance:
   a. Length and Width: +/-1/8 -inch
   b. Square - Not to exceed 1/8 - inch for 8 foot panels or 5/32 - inch for 10 foot panels.

B. Properties for Induro FRP: Resistant to rot, corrosion, staining, denting, peeling, and splintering.

1. Flexural Strength - 1.7×10^4 psi per ASTM D 790.
2. Flexural Modulus – 6.0×10^5 psi per ASTM D 790.
3. Tensile Strength - 8.0×10^3 psi per ASTM D 638.
4. Tensile Modulus – 9.43×10^3 psi per ASTM D 638.
5. Water Absorption - 0.17% per ASTM D 570.
6. Barcol Hardness (scratch resistance) of 22 as per ASTM D 2583.
7. Izod Impact Strength of 7.0 ft. lbs./in ASTM D 256.

C. Back Surface: Smooth. Imperfections which do not affect functional properties are not cause for rejection.

D. Front Finish:

1. Color: As scheduled
2. Surface: Smooth surface texture.
3. Fire Rating Class C.

2.03 MOLDINGS

A. Aluminum Anodized Trim: Heavy weight extruded aluminum 6063-T5 alloy prefinished at the factory.

1. F550 Inside Corner, 8-feet length
2. F561 Outside Corner, 8-feet length
3. F565 Division, 8-feet length
4. F570 Edge, 8-feet length
5. Color: Brite Satin Anodized.

2.04 ACCESSORIES

A. Adhesive: Construction adhesives complying with ASTM C 557.

1. Marlite C-551 FRP Adhesive - Water- resistant, non-flammable adhesive

B. Sealant:

1. Marlite Brand MS Color match Sealant.

PART 3 - EXECUTION

3.01 PREPARATION

A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.

1. Verify that stud spacing does not exceed 24-inches on-center.

B. Repair defects prior to installation.

1. Level wall surfaces to panel manufacturer's requirements. Remove protrusions and fill indentations.

3.02 INSTALLATION

A. Comply with manufacturer's recommended procedures and installation sequence.

B. Cut sheets to meet supports allowing l/8-inch clearance for every 8 foot of panel.

1. Cut and drill with carbide tipped saw blades or drill bits or cut with shears.

2. Pre-drill fastener holes 1/8-inch oversize with high speed drill bit.

a. Space at 8-inches maximum on center at perimeter, approximately 1-inch from panel edge.

b. In the panel field, space fasteners 12-inches on-center maximum in rows spaced 16-inches on center.

C. Apply panels to board substrate, above base, vertically oriented with seams plumb and pattern aligned with adjoining panels.

1. Install panels with manufacturer's recommended gap for panel field and corner joints.

2. Adhesive trowel and application method to conform to adhesive manufacturer's recommendations.

3. Drive fasteners for snug fit. Do not over-tighten.

D. Apply panel moldings to all panel edges using silicone sealant providing for required clearances.

1. All moldings must provide for a minimum 1/8 –inch of panel expansion at joints and edges, to insure proper installation.

2. Apply sealant to all moldings, channels and joints between the system and different materials to assure watertight installation.

3.03 CLEANING

A. Remove excess sealant from panels and moldings. Wipe panel down using a damp cloth and mild soap solution or cleaner.

B. Refer to manufacturer's specific cleaning recommendations Do not use abrasive cleaners.

END OF SECTION

SECTION 06615 – SOLID SURFACE COUNTERTOPS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Solid surface material countertops and backsplashes.

B. Related Sections:

1. Section 05500 – METAL FABRICATIONS for countertop support brackets.
2. Section 06100 - ROUGH CARPENTRY.
3. Section 06412 – ARCHITECTURAL CASEWORK

1.02 SUBMITTALS

A. Submit under the provisions of Section 01330 - SUBMITTALS.

B. Manufacturer's Data: Submit manufacturer's technical data for each type of countertop material, accessory and other manufactured product required.

C. Shop Drawings: Submit cutting and setting drawings indicating sizes, dimensions, sections and profiles of solid surface units, arrangement and provisions for jointing,.

D. Sealant supporting, anchoring and bonding solid surface material; and other details showing relationships with, attachment to, and reception of, related work such as sinks and plumbing fixtures.

E. Samples: Submit sets of samples for each type of solid surface countertop consisting of units not less than 12 inches by 12 inches. Include 2 or more units in each set of samples showing the full range of appearance characteristics to be expected in completed Work.

F. Maintenance Data: For solid surface countertops to include in maintenance manuals. Include Product Data for solid surface care products used or recommended by Installer, and names, addresses, and telephone numbers of local sources for products.

1.03 QUALITY ASSURANCE

A. Fabricator Qualifications: Engage a fabricator that employs skilled workers who custom-fabricate solid surface countertops and who has successfully completed work similar in material, design and extent to that indicated for this project. The fabricator shall be the installer of the countertops.

B. Cut all openings from templates for plumbing fixtures, trim, and accessories to be mounted.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver no components to project site until areas are ready for installation.

B. Store components indoors prior to installation.

C. Handle materials to prevent damage to finished surfaces.

1. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.05 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

1.06 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops.

1.07 WARRANTY

A. Provide manufacturer's warranty against defects in manufacturing and workmanship of solid surface assemblies for a period of ten (10) years from the Project Acceptance date.

PART 2 - PRODUCTS

2.01 SOLID SURFACE MATERIAL COUNTERTOPS

A. Countertops and Backsplashes: 1/2-inch- thick, solid surface material with beveled edges.

B. Fabrication: Fabricate tops in one piece unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

2.02 COUNTERTOP MATERIALS

A. Solid Surface Material: Homogeneous solid sheets; cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6.

1. Basis-of-Design Product (**SS-01**): Products described in this Section are products of Dupont Corian. Subject to compliance with requirements, provide products by one of the following:

a. Formica.

b. LG Hausys America, Inc.

c. Wilsonart International

d. or Approved Equal.

2. Colors and Patterns: As scheduled.

3. Nominal Thickness: 1/2- inch minimum thickness as indicated.

4. Edge Detail: As Detailed.

5. Splashes: Provide 1/2-inch-thick backsplashes and end splashes, unless otherwise indicated.
    a. Height: As indicated on the Drawings.
    b. Top-Edge-Detail: As Detailed.
6. Joint Adhesive: Manufacturer's standard one- or two-part adhesive kit to create inconspicuous, nonporous joints.
7. Sealant: Manufacturer's standard mildew-resistant, FDA-compliant, NSF 51-compliant (food zone — any type), UL-listed silicone sealant in colors matching components.

2.03 FABRICATION

A. Fabricate solid surface material countertops in sizes and shapes required to comply with requirements indicated, including details on Drawings and final shop drawings. Provide matching backsplash.

B. Joints: To the great extent possible, fabricate countertops to be one piece with no joints.
    1. Where joints are unavoidable, form joints between components using manufacturer's standard joint adhesive without conspicuous joints. Reinforce with strip of solid polymer material, 2" wide.

C. Cutouts: Cut openings to accommodate other work and indicated features.
    1. Cutouts shall have 3/8 inch minimum inside corner radius. Inside corners shall be reinforced in an acceptable manner to prevent cracking. Smooth edges.

D. Cut and drill sinkages and holes in solid surface material for anchors, supports, and attachments.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Require Installer to examine surfaces to receive solid surface countertops and conditions under which countertops will be installed and to report in writing any conditions which are not in compliance with requirements. Do not proceed with installation until surfaces and conditions comply with requirements indicated or for execution of other work which affects the installation.

B. Verify that substrates supporting solid surface countertops are plumb, level, and flat to within 1/16 inch in ten feet and that necessary supports and blocking are in place.

3.02 INSTALLATION

A. Execute installation of solid surface countertops by skilled mechanics. Do necessary field cutting as counters are set. For exposed edges, produce edges which are cut straight and true.

B. Set counters to comply with requirements indicated on drawings and final shop drawings. Install supports, fasteners, and other attachments indicated or necessary to secure counters in place. Shim and adjust anchors, supports and accessories to set counters accurately in locations indicated with uniform perimeter joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerance.

C. Anchor securely to base cabinets or other supports.

D. Install applied backsplashes using manufacturer's standard color-matched silicone sealant. Adhere applied backsplashes to countertops using manufacturer's standard color-matched silicone sealant.

E. Install countertops and backsplashes plumb, level, square and flat to within 1/16-inch in ten feet.

F. Apply sealant to gaps specified for filling with sealant. Remove temporary shims before applying sealant.

3.03 ADJUSTMENTS AND CLEANING

A. In-Progress Cleaning: Clean countertops as work progresses. Remove adhesive and sealant smears immediately.

B. Remove and replace countertop if broken, chipped, stained or otherwise damaged that cannot be repaired to the Architect's satisfaction.

C. Replace in manner which results in countertops matching approved samples, complying with other requirements and showing no evidence of replacement.

D. Clean countertops after adhesives and sealants have fully cured and set, using clean water and soft rags. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage countertops.

END OF SECTION

SECTION 07270 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.01 SUMMARY

A. Work includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

B. Related Work Described Elsewhere:

1. Section 09250 – GYPSUM BOARD ASSEMBLIES.
2. Section 15400 – PLUMBING.
3. Section 16011 – GENERAL ELECTRICAL REQUIREMENTS.

1.02 REFERENCES

A. ASTM E 84 Test Method for Surface Burning Characteristics of Building Materials

B. UL-05 Underwriters Laboratory, Inc. Fire Resistance Directory.

C. UL 2079-98 Standard Tests for Fire Resistance of Building Joint Systems.

D. ASTM E 119-00a Fire Tests of Building Construction and Materials.

E. UL 1497-94 Fire Tests of Through-Penetration Firestops.

F. NFPA 70 National Electric Code.

G. 2012 International Building Code with Kauai County Amendments

1.03 PERFORMANCE REQUIREMENTS

A. Select and provide through-penetration firestop systems test by Underwriters Laboratories or another qualified testing and inspection agency to resist spread of fire according to requirements indicated, resist passage of smoke and other gases and maintain the fire resistance rating of the construction penetrated as determined by UL 1497-94.

1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
    a. Penetrations located outside wall cavities.
    b. Penetrations located outside fire-resistance-rated shaft enclosures.
    c. Penetrations located in construction containing fire protection rated openings.

d. Penetrating items larger than 4-inches in diameter nominal pipe or 16 square inch in overall cross sectional area.

B. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

2. For floor penetrations with annular spaces exceeding 4-inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.

3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

C. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

D. Select and provide fire resistive joint systems test by Underwriter's Laboratories or other qualified testing and inspecting agency to resist spread of fire, resist passage of smoke and other gases, and maintain the fire resistance rating of the construction penetrated and, where applicable, UL 1497-94 and UL testing standard 2079.

1.04 SUBMITTALS

A. Product Data: For each through-penetration firestop system indicated submit documentation, including illustrations, from Underwriter's Laboratories or other certified testing and inspecting agency. Submit data for the component products of the selected systems.

B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.

2. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

C. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:

1. Types of penetrating items.

2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.

3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.

D. Qualification Data: For firms and persons specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, name and addresses of the architects and owners, and other information specified.

E. Product Certificates: For through-penetration firestop system products, signed by product manufacturer.

F. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Firestopping tests are performed by Underwriter’s Laboratories (UL).

2. Through-penetration firestop systems are identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements:

a. Through-penetration firestop system products bear UL classification marking.

b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:

i. UL in its "Fire Resistance Directory."

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 01310 – PROJECT MANAGEMENT AND COORDINATION. Manufacturer’s technical representative must attend.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.08 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements. Coordination includes but not limited to:

1. Offsetting the penetrating item from parallel walls, ceilings or from other penetrating items so that the penetration details match the tested design on all sides.

2. Rerouting the penetrating item so the item penetrates the rated barrier at a 90 degree angle or at an angle sufficiently great to stay within the limits of he tested design.

B. Limiting the size of sleeves, openings, core-drilled holes, or cut openings so that the annular space remaining between the penetrating item and the surrounding construction does not exceed that of the tested design.

C. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application that are produced by one of the following manufacturers:

1. Hilti Construction Chemicals, Inc.

2. Isolatek International

3. Nelson Firestop Products.
4. Specified Technologies Inc.
5. 3M; Fire Protection Products Division.
6. Tremco; Sealant/Weatherproofing Division.

2.02 FIRESTOPPING, GENERAL

A. Asbestos Prohibition: No materials or equipment containing asbestos shall be used under this section. Assure that all materials and equipment used in the project are asbestos free.

B. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

C. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

D. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

E. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
2. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

F. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.

1. Permanent forming/damming/backing materials, including the following:
   a. Slag-wool-fiber or rock-wool-fiber insulation.
   b. Fillers for sealants.
2. Temporary forming materials.
3. Substrate primers.

2.03 FILL MATERIALS

A. Intumescent Sealants: Single component intumescent latex formulations containing no water-soluble intumescent ingredients capable of expanding a minimum 8 times.

B. Intumescent Putties: Non-hardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds for protection of electrical switch and receptacle boxes to reduce horizontal separation to less than 24-inches and allow for back-to-back conditions.

C. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

D. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and non-sag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of non-sag grade for both opening conditions.

2.04 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.

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

3.02 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.

2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration

firestop systems. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.03 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 FIRE RESISTIVE JOINT SYSTEM INSTALLATION

A. Perimeter Fire Containment Systems:

1. Where indicated for gaps between tops of fire resistance rated partitions assemblies and fire resistance rated ceilings, floor slabs, and roofs, provide a perimeter fire containment system with the fire test response rating of the assembly indicated, as determined by UL 2079. Materials shall be identified with UL classification markings.

3.05 PUTTY PAD INSTALLATION

A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

B. Installation:

1. Remove the release paper.
2. Inspect the outlet box to make sure it is properly installed and free of free of dust, grease, oil, loose materials, rust or other substances.
3. Starting at side, align the putty pad to front edge of box and overlap onto the stud.
4. Cut the putty pad to allow the pad to fit around conduits or cables.
5. Pleat the extra material at the corners.
6. Fold the pleated corners into place and firmly press the putty pad into place so that the entire surface of the back of the outlet box is covered.

3.06 IDENTIFICATION

A. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6-inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:

1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

3.07 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2174 and to prepare test reports. Inspecting Agency will state in each report whether inspected through-penetration firestop systems comply with or deviate from requirements.

B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.08 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Project Acceptance. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

END OF SECTION

August 16, 2021

SECTION 07600 - FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 SUMMARY

A. Provide all labor, materials and equipment necessary to install flashing, , and other related work as shown on drawings and as specified herein.

1.02 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

C. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.03 SUBMITTALS

A. General: Submit under provisions of Section 01330 – SUBMTTAL PROCEDURES.

B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes

C. Shop Drawings: Submit shop drawings to the Architect for approval, showing layouts of sheet metal flashing and trim, including plans, elevations and details. Distinguish between shop and field assembly works. No fabrication will be permitted before approval is secured. Include the following:

   1. Identify material, thickness, weight, and finish for each item and location in Project.

   2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.

   3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.

   4. Details of expansion-joint covers, including showing direction of expansion and contraction.

1.04 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" and the NRCA's Roofing and Waterproofing Manual in coordination with requirements of roofing and waterproofing systems (the more stringent shall apply). Conform to dimensions and profiles shown unless more stringent requirements are indicated.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.

B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.06 COORDINATION

A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

B. Fabricate flashings from materials noted below as most appropriate in regards to the system that the flashing is being integrated with and / or adjacent to and in coordination with the drawings and finish schedules. Concealed flashings may be mill finish.

1.07 WARRANTY

A. The Contractor shall execute to the Owner a 5-year written warranty that the installation will be watertight and that any leaks which develop during that period which are not due to improper use or willful damage will be repaired at no cost to the Owner.

B. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Sheet Metal Finish: Deterioration includes, but is not limited to, the following:

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

b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Asbestos Prohibition: No asbestos containing materials or equipment shall be used in this section. The Contractor shall ensure that all materials and equipment incorporated in the project are asbestos-free.

B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet in accordance with ASTM A653, G90 coating designation, prepainted by coil-coating process to comply with ASTM A755..

C. Fasteners: Same material as flashing/sheet metal, or other noncorrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.

1. For attachment to wood substrates and blocking, provide 18-8/Type 304 stainless steel nails not less than 1-1/4-inch long, barbed with large head.

2. For attachment to concrete or masonry provide 1/4-inch by 2-inches long, 18-8/Type 304 stainless steel drive pins with neoprene bonded stainless steel washers

D. Isolation Membrane: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, non-perforated. To be used to isolate flashing metal from dissimilar metals or corrosive substrates.

E. Sealants and Sealant Tape:

1. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

2. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

3. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

F. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.02 FABRICATION

A. General: Fabricate sheet metal copings and low-slope roof edge systems to comply with ANSI/SPRI ES-1 and all other flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.

B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

1. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

D. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

E. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

2.03 WALL FLASHING

A. Openings Flashing in Frame Construction: Fabricate sill and similar flashings to fit wall openings. Form sill flashing with 2-inch high end dams.

2.04 FINISHES

A. Finishes: Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Humidity Resistance: 2000 hours.

2. Salt-Spray Resistance: 2000 hours.

3. Color: As selected by the Architect.
   a. .

PART 3 - EXECUTION

3.01 INSTALLATION AND WORKMANSHIP

A. Surface to which sheet metal is to be applied shall be even, smooth, sound, thoroughly clean and dry, and free from defects that might affect the application. Report any unsatisfactory surfaces to the Architect. In the absence of such a report, the Contractor shall be held responsible for the finished product.

B. All accessories or other items essential for the completeness of the sheet metal installation, though not specifically indicated on the drawings or specified, shall be provided. All such items unless otherwise indicated on the drawings or specified, shall be of the same kind of materials as the item to be applied. Nails, screws, rivets, and bolts shall be of the type best suited for the purpose intended and shall be of a composition that is compatible with the metal to which it will contact.

C. Except as otherwise indicated on the drawings or specified, the workmanship of sheet metal work, method of forming joints, anchoring, cleating, provisions for expansion, etc., shall conform to the standards details and recommendations of the Sheet Metal and Air Conditioning Contractors National Association's "Architectural Sheet Metal Manual" and shall be subject to the approval of the Architect.

1. Torch cutting of sheet metal flashing and trim is not permitted.

D. All sheet metal work shall be watertight and wind-tight in compliance with the purpose intended for the items indicated on the drawings or specified herein.

E. Install sheet metal flashing and trim true to line and levels indicated without excessive oil canning, buckling and tool marks. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.

F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with elastomeric sealant concealed within joints.

G. Fasteners: Use fasteners of types and sizes indicated that will penetrate substrate not less than 1-1/4 inches.

H. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures.

1. Prepare joints and apply sealants to comply with requirements in Section 07910 – EXTERIOR WALL JOINT SEALANTS.

I. Protection from Contact of Dissimilar Materials: Surfaces in contact with dissimilar metal shall be painted with heavy-bodied bituminous paint or shall be separated by means of moisture-proof building felts.

3.02 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings: Install continuous sill, and similar flashings to fit within the wall openings.

1. Form end dams in sill flashing at each end where flashing meets the side of the opening. Turn metal up a minimum of 2-inches.

3.03 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

E. Protect all sheet metal work until final acceptance of the building.

F. At completion of the work, clean up and remove all rubbish and debris from the premises which resulted from this work.

END OF SECTION

August 16, 2021

SECTION 07920 - SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: All sealants used to completely close all joints indicated or specified to be filled or sealed to a watertight, smoke-tight or acoustical condition as required for the particular application indicated.

1.02 SUBMITTALS

A. Submit under the provisions of Section 01330 – SUBMITTAL PROCEDURES.

B. Manufacturer's Data: Submit copies of manufacturer's product data and specifications for type of sealant required, to the Architect for approval.

C. Material Safety Data Sheets (MSDS): Submit MSDS for each sealant product.

D. Color Samples: Submit sets of color finish samples of sealants.

1.03 JOB CONDITIONS

A. Examine joint surfaces and backing, and their anchorage to the structure, and conditions under which joint sealer work is to be performed, and notify Contractor in writing of conditions detrimental to proper completion of the work and performance of sealers. Do not proceed with joint sealer work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

B. Weather Conditions: Do not proceed with installation of sealants under adverse weather conditions. Proceed with the work only when weather conditions are favorable for proper cure and development of high early bond strength.

1.04 PRODUCT HANDLING

A. Delivery: Deliver sealants to the jobsite in sealed containers labeled to show the designated name, formula, or specification number, lot number, color, date of manufacture, shelf life, curing time, manufacturer's directions, and name of manufacturer.

B. Storage: Carefully handle and store all materials to prevent inclusion of foreign materials. Remove from project site all damaged and deteriorated materials and materials exceeding shelf life.

C. All sealant materials shall be installed prior to expiration of shelf life.

1.05 WARRANTY

A. Provide a 2-year written warranty against leaks, air infiltration, cracks, and other failures of the installation and materials.

1. Repair of sealants to seal leaks caused by faulty materials or workmanship;

2. Repair or replace damage to the building or its finishes, equipment or furniture when occasioned by such leaks.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Asbestos Prohibition: No asbestos containing materials or equipment shall be used in this section. The Contractor shall ensure that all materials and equipment incorporated in the project are asbestos-free.

B. Sealant Backer Rod: Compressible rod stock of polyethylene foam, polyethylene-jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable, non-absorptive material as recommended for compatibility with sealant by the sealant manufacturer to control the joint depth for sealant placement, to break bond of sealant at bottom of joint, to form optimum shape of sealant bead on back side, and to provide a highly compressible backer which will minimize the possibility of sealant extrusion when joint is compressed. Do not use oakum or other types of absorptive materials as backstops.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer.

D. Masking Tape: Non-staining, nonabsorbent type compatible with joint sealants and to surfaces adjacent to joints.

E. Primer for Sealants: Non-staining, as recommended by the sealant manufacturer.

F. Sealants: All site-applied, interior wood adhesives and sealants shall comply with low-VOC limits

1. At Interior Vertical and Overhead Moving Joints except at tile joints (**JS-03**): One-part polyurethane-based sealant, conforming to ASTM C 920, Type S, Grade NS, Class 25, Use NT. Provide products from one of the following, or approved equal:

   a. Tremco, Inc.

   b. Bostik Construction Products Div.

   c. Sika Corp.

   d. Pecora Corp.

   e. Sonneborn.

2. At Interior Vertical and Overhead Non-Moving Joints (**JS-04**): Non-Elastomeric Sealant; acrylic-emulsion type, conforming to ASTM C 834. Provide one of the following, or approved equal:

   a. AC-20 Acrylic Latex: Pecora Corp.

   b. Tremco Acrylic Latex 834; Tremco, Inc.

   c. Chem-Calk 600; Bostik Construction Products Div.

   d. Sonolac; Sonneborn.

3. At Horizontal Traffic-Bearing Joints (**JS-05**): Two-part polyurethane based sealant, conforming to ASTM C 920, Type M, Grade P, Class 25, Use T. Provide one of the following, or an approved equal:

a. Sikaflex 2c SL; Sika Corp.

b. THC-900; Tremco, Inc.

c. Urexpan NR-300; Type HM; Pecora Corp.

d. SL-2; Sonneborn.

4. Silicone Sealant: At Perimeter of All Plumbing Fixtures and Fittings and wall and floor tile movement joints (**JS-06**): One-part mildew-resistant silicone sealant conforming to ASTM C 920, Type S, Grade NS, Class 25, Use NT, formulated with fungicide; intended for sealing interior joints with non-porous substrates. For use in kitchens and food preparation areas provide sealant complying with FDA requirements. Provide one of the following, or approved equal:

   a. Dow Corning 786; Dow Corning Corp.

   b. SCS 1702 Sanitary; General Electric Co.

   c. Tremsil 600 White; Tremco, Inc.

   d. Omni Plus; Sonneborn.

   e. 898 or 893, No. 345; Pecora Corp.

5. Bedding Compound (**JS-07**): For installation of thresholds and similar items indicated to be bedded in sealant, use a preformed butyl-polyisobutylene sealant tape. Size of tape as required for the specific application. Provide one of the following, or approved equal:

   a. Extru-Seal; Pecora Corp.

   b. 440 Tape; Tremco, Inc.

   c. Chem-Tape 40; Bostik Construction Products Div.

6. Acoustical Sealant: Provide one of the following, or approved equal:

   a. Fire-rated and Non-rated Exposed Joints and Fire-rated Concealed Joints (**JS-08a**): Non-sag, paintable, non-staining, latex sealant complying with ASTM C 834, ASTM A 119 or ANSI/UL 263 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90 as well and resists the spread of fire and passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which the sealant is installed.

      1) AC-20 FTR; Pecora Corp.

      2) SpecSeal ES Elastomeric Sealant, Specified Technologies, Inc.

      3) MasterSeal NP 520, BASF.

      4) or Approved Equal.

   b. Non-Rated Concealed Joints (**JS-08b**): Non-drying, non-hardening, non-skinning, non-staining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

      1) BA-98; Pecora Corp.

2) Tremco Acoustical Sealant; Tremco.

3) Pro-Series SC-170; Ohio Sealants.

4) Or Approved Equal.

PART 3 - EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Comply with manufacturer's printed instructions except where more stringent requirements are shown or specified, and except where manufacturer's technical representative directs otherwise.

3.02 EXAMINATION

A. Examine joints indicated to receive joint sealers, with Installer present, for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance. Do not proceed with installation of joint sealers until unsatisfactory conditions have been corrected.

3.03 JOINT PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:

1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; oil; grease; waterproofing; water repellants; water; and surface dirt.

2. Clean unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.

3. Remove laitance and form release agents from concrete.

4. Steel Surfaces in Contact with Sealant: Scrape and wirebrush to remove loose mill scale. Remove dirt, oil, or grease by solvent cleaning, and wipe surfaces with clean cloths.

5. Clean metal, glass, glazed surfaces of ceramic tile, and other nonporous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's

recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.04 INSTALLATION OF JOINT SEALERS

A. General: Comply with joint sealer manufacturers' printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply. Do not apply sealant on wet surfaces or when the surface temperature exceeds 130 degrees F.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions indicated.

C. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.
    a. Do not leave gaps between ends of joint fillers.
    b. Do not stretch, twist, puncture, or tear joint fillers.
    c. Remove absorbent joint fillers which have become wet prior to sealant application and replace with dry material.
2. Install bond breaker tape between sealants and joint fillers, compression seats, or back of joints where adhesion of sealant to surfaces at back of joints would result in sealant failure.
3. Install compressible seals serving as sealant backings to comply with requirements indicated above for joint fillers.

E. Primer: Immediately prior to application of the sealant, clean out all loose particles from joints. Where recommended by sealant manufacturer, apply primer to joints in wood and other porous surfaces in accordance with compound manufacturer's instructions. Do not apply primer to exposed finish surfaces.

F. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.

G. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of

configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 8A in ASTM C 1193, unless otherwise indicated.
2. Provide flush joint configuration per Figure 8B in ASTM C 1193, where indicated.

H. Showers: Apply sealant to all penetrations through the finish materials, at flanges, eschusions and cover plates.

3.05 CLEAN UP

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

3.06 PROTECTION

A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.

END OF SECTION

August 16, 2021

SECTION 08115 – PREFINISHED STEEL DOOR FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Prefinished steel door frames as scheduled.

B. Related Work Described Elsewhere:

1. Section 06100 – ROUGH CARPENTRY
2. Wood Doors as specified in Section 08210 – WOOD DOORS
3. Finish hardware is specified in Section 08710 - FINISH HARDWARE.
4. Lead lined steel frames as specified in Section 13490 - RADIATION PROTECTION.

1.02 REFERENCES

A. ASTM – American Society for Testing and Materials

1. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM B117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.
3. ASTM D2197 - Standard Test Method for Adhesion of Organic Coatings by Scrape Adhesion.
4. ASTM D2247 - Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
5. ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
6. ASTM D3361 - Standard Practice for Unfiltered Open-Flame Carbon-Arc exposures of Paint and Related Coatings.

B. NFPA – National Fire Protection Association

1. NFPA 80 - Fire Doors and Windows (Latest Edition)
2. NFPA-101 - Life Safety Codes (Latest Edition)

C. UL - Underwriters Laboratory

1. UL 10B Fire Test of Door Assemblies
2. UL10C Standard for Positive Pressure Fire Tests of Door Assemblies

1.03 QUALITY ASSURANCE

A. Provide frames complying with ANSI/SDI 100 “Recommended Specifications for Standard Steel Doors and Frames” and as herein specified.

B. Fire-Rated Assemblies: Where fire-rated assemblies are indicated or required, provide fire-rated door assemblies that comply with NFPA 80 “Standard for Fire Doors and Fire Windows”, and have been tested, listed, and labeled in accord

ance with UL 10 C “Positive Pressure Fire Tests of Door Assemblies” and NFPA 252 “Standard Methods of Fire Tests of Door Assemblies” by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.

C. Hardware Mounting Heights: The Contractor shall be responsible to coordinate all mounting heights of various finish hardware with all project requirements.

1.04 SUBMITTALS

A. Submit under the provisions of Section 01330 – SUBMITTAL PROCEDURES.

B. Manufacturer’s Data: Submit manufacturer’s technical product data substantiating that products comply with requirements.

C. Shop Drawings: Submit for fabrication and installation of steel frames. Include details of each frame type, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections, gauges, and finishes. Show anchorage and accessory items.

D. Samples: Submit three (3) standard frame samples, illustrating factory finished frame colors.

E. Schedule: Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.

F. Label Construction Certification: For assemblies required to be fire-rated and exceeding sizes of tested assemblies, submit manufacturer’s certification for that each frame assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver steel frames cartoned or crated to provide protection during transit and job storage.

B. Inspect steel frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to the Architect; otherwise, remove and replace damaged items as directed.

C. Store frames at building site under cover in a dry, secure place. Place units on minimum 4-inch high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chambers.

1.06 WARRANTY

A. Manufacturer's Certificate of Warranty: Provide manufacturer’s standard warranty certificate stating material is warranted for a period of one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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

1. Basis of Design: Timely Industries and Division of SDS Industries, Inc.
2. Comparable product acceptable to the Architect.

2.02 MATERIALS

A. Frame Material: Cold-rolled, commercial quality carbon steel, hot-dipped galvanized, 18 gauge minimum.

B. Frame Profiles: C-Series; F- profile.

C. Frame Casings:TA-8 Steel casing in same finish as door frame..

D. Accessories:

1. Corner connectors
2. Hardware Reinforcements for closers, hinges, exit devices and door guards; 14 gauge.
3. Silencers: TA-5 vinyl, 2 per frame, clears stick-on type. Silencers not required on kerfed frames or frames scheduled to receive stop mounted gasket or weatherstrip.

E. Fasteners: Types required by Manufacturer for each fastening condition. Provide stainless steel fasteners for exposed framing and corrosion resistant types for interior locations.

F. Touch-up Paint: Manufacturer's provide touch-up paint; color to match the color of the frame requiring touch-up.

2.03 FABRICATION

A. General: Fabricate units using Manufacturers standard production methods as required to comply with the Project design intent as fully submitted and successfully reviewed by Architect.

B. Openings for single swing, pair, borrowed light and sidelight frames to be pre- cut, notched and fabricated at the manufacturer's facility. For fire rated and exterior openings, provide kerf at stop for installation of smoke gasket or weatherstrip.

C. Finishes:

1. Steel Units:
    a. ASTM A 653, Hot-dipped galvanized Coating: G30 minimum.
    b. Paint Coating: Standard impact resistant, baked-on polyurethane enamel finish in custom color as scheduled or to be selected by Architect.
    c. Primed frames to have 90-minute fire label embossed into frame in lieu of mylar label.

PART 3 - EXECUTION

3.01 COORDINATION

A. Coordinate the installation of the frames with the finish hardware installation specified in Section 08710 – FINISH HARDWARE and wood doors as specified in Section 08210 – WOOD DOORS.

3.02 INSTALLATION

A. General: Install prefinished steel frames in accordance with final shop drawings, manufacturer's data, and as herein specified.

B. Placing Frames: Comply with provisions of SDI-105 "Recommended Erection Instructions for Steel Frames", unless otherwise indicated.

1. Anchors: Provide sufficient anchorage to attach to wall in accordance with ANSI A250.4 Test compliance Level A of one million cycles, or anchorage as detailed on drawings to specific wall conditions.

2. Install fire-rated frames in accordance with NFPA 80.

3.03 ADJUST AND CLEAN

A. Factory Coat Touch-up: Touch-up damaged areas of factory coating and apply touch-up of matching air-drying coating.

B. Final Adjustments: Check and readjust operating finish hardware items, leaving steel frames undamaged and in complete and proper operating conditions.

END OF SECTION

August 16, 2021

SECTION 08210 - WOOD DOORS

PART 1 - GENERAL

1.01 SUMMARY

A. Types of doors required include interior flush wood doors with glass lites.

1. Non-rated doors

2. Fire-rated doors

B. Related Work Described Elsewhere:

1. Section 08115 – PREFINISHED STEEL DOOR FRAMES.

2. Section 09900 – PAINTING for wood door finish.

3. Lead lined radiation-shielded solid core wood doors as specified in Section 13490 - RADIATION PROTECTION

1.02 SUBMITTALS

A. Submit under the provisions of Section 01330 – SUBMITTAL PROCEDURES.

B. Manufacturer's Data: Door manufacturer's technical data for each type of door, including details of core and edge construction.

C. Shop Drawings: Submit shop drawings indicating location and size of each door, door swing, stile and rail dimensions, veneers, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, and other pertinent data.

D. Submit certificates issued by an independent testing agency stating that doors scheduled to be acoustically rated, in fact meet the specified STC ratings when tested in accordance to ASTM E 90 and ASTM E 413.

E. Samples: Request wood and finish samples from Contracting Officer for species of wood and types of finish. Submit 3 verification samples of each type of wood species and finish for approval.

1.03 QUALITY ASSURANCE

A. Quality Standards: Comply with the following standards:

1. WDMA Quality Standard:

a. Flush Wood Doors: WDMA I.S.-1A "Wood Flush Doors"".

b. Stile and Rail Doors: WDMA I.S.-6A "Industry Standard for Architectural Stile and Rail Doors".

2. AWS Quality Standards: "Architectural Woodwork Standards", including Section 4 "Sheet Products", Section 9, "Door" of Architectural Woodwork Standards (AWS) for grade of door, core construction, finish and other requirements exceeding those of WDMA quality standard.

B. WDMA Quality Markinq: Mark each wood door with WDMA Wood Door Certification Hallmark certifying compliance with applicable requirements of

ANSI/NWWDA I.S.-1A and WDMA I.S.-6A. For manufacturers not participating in WDMA Hallmark Program, a certification of compliance may be substituted for marking of individual doors.

C. Fire-Rated Wood Doors: Provide wood doors which are identical in materials and construction to units tested in door and frame assemblies per NFPA 252 “Fire Tests of Door Assemblies”, and UL 10C, “Fire Tests of Door Assemblies”, and which are labeled and listed for ratings indicated by UL, Warnock Hersey or other testing and inspection agency acceptable to authorities having jurisdiction. Labels shall be metal with raised letters and shall bear the rating followed by the letter “S”, name and file number of the door manufacturer and the service conducting the inspection. Labels shall not be painted.

D. Acoustical Rated Doors: Provide acoustical doors with an STC rating as scheduled when tested as an operable system in accordance with ASTM E90 and ASTM E413.

1. Interior Flush Door: STC rating of 40.

E. Factory seal all doors on all 6 sides using manufacturer’s standard.

F. Manufacturer: Obtain from a single manufacturer for each type of wood door or all doors for one manufacturer.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protect doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations of WDMA I.S.-1A Section J-1 “Job Site Information”, and WDMA 1.S 6A, as well as with manufacturer’s instructions.

B. Identify each door with individual opening numbers which correlate with designation system used on shop drawings for door, frames, and hardware, using temporary, removable or concealed markings.

C. Do not walk on or stack other materials on top of stacked doors. Do not drag doors across one another.

D. For all doors not factory finished, seal all four edges immediately after delivery.

E. Store doors away from threat of termite or other insect infestation.

1.05 PROJECT CONDITIONS

Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during remainder of construction period to comply with the following requirements applicable to project’s geographical location: AWS Section 2 paragraph 1.2.3, “Relative Humility and Moisture Content.”.

1.06 WARRANTY

A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

B. Door Manufacturer’s Warranty: Submit written agreement on door manufacturer’s standard form signed by Manufacturer, Installer and Contractor, agreeing to

repair or replace defective doors which have warped (bow, cup or twist) or that show telegraphing of core construction in face veneers, or do not conform to tolerance limitations of referenced quality standards.

1. Warranty shall be in effect during following minimum period of time after date of Substantial Completion, unless longer warranty is standard with the manufacturer.
2. Flush Interior Doors: One year.

C. Contractor's Responsibilities: Replace or refinish doors where Contractor's work contributed to rejection or to voiding of manufacturer's warranty.

PART 2 - PRODUCTS

2.01 ASBESTOS PROHIBITION

A. No asbestos containing materials or equipment shall be used in this section. The Contractor shall ensure that all materials and equipment incorporated in the project are asbestos-free.

2.02 MANUFACTURERS

A. Basis-of-Design: The flush wood doors products indicated in this section and on the drawings are products of Lynden Door, Inc. Subject to compliance with requirements and Architect's approval products from the following manufacturers may be substituted:

1. Masonite Architectural
2. Simpson Door Company
3. VT Industries, Inc.

2.03 WOOD FLUSH DOORS

A. Flush Doors: Comply with the following requirements:

1. Core: Structural composite lumber core
2. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.
3. Faces:
   a. For transparent finish, AWS Custom, Plain sliced White Birch; book-matched.
   b. Stiles: Applied wood-veneer edges of same as faces and covering edges of faces.
4. Fire Rated Doors:
   a. Rating: As indicated on the schedule
   b. Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.

c. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as needed to eliminate through-bolting hardware.

d. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile matching face veneer, and laminated backing at hinge stiles for improved screw-holding capability and split resistance.

5. Glass Panels: Kind FT (fully tempered), Condition A, Type 1, Class 1, Quality q3, 1/4-inch thick unless indicated or required otherwise.

   a. Glazing stops to match wood panel doors with ogee profile.

6. Configuration: As shown in the Drawings.

7. Finish: Factory finish as specified herein.

B. Sound Retardant Doors: Comply with the following requirements:

1. Core: Door manufacturers sound attenuation core capable of provide the specified STC rating.

2. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

3. Faces: AWS Custom: plain-slice paint-grade Birch or Medium Density Overlay (MDO).

4. Stiles: Applied wood-veneer edges of same as faces and covering edges of faces.

5. STC rated door submittals to include same seals and drop bottoms used in ASTM E90 test.

2.04 FABRICATION

A. Wood Doors: Fabricate wood doors to produce doors in sizes indicated for job-site fitting. Stile edge bands of doors to be painted shall be mill option specie. No visible finger joints will be accepted in stile edge bands. When used, locate finger-joints under hardware.

B. Openings:

1. Light Openings: Trim openings with moldings of material and profile indicated.

2. Glazing: Factory install glazing in doors indicated to be factory finished.

C. Adhesives: Adhesives shall be in accordance with WDMA I.S.-1A, requirements for Type I Bond Doors (waterproof) for exterior doors and requirements for Type II Bond Doors (water repellent) for interior doors. Adhesives shall contain no formaldehydes.

D. Finish Hardware: Locate hardware to comply with DHI-WDHS-3 and each door that is an element of an accessible route shall comply with Americans with Disabilities Act Accessibility Guidelines (ADAAG) Section 4.13. Comply with finish hardware schedules, doorframe shop drawings, DHI A115-W series standards, and hardware templates.

2.05 PRESERVATIVE TREATMENT

A. Treat all solid core doors at factory with water repellent after manufacturing has been completed, in accordance with WDMA Industry Standard I.S.-4 “Water-Repellent Preservative non-Pressure Treatment for Millwork”.

2.06 WOOD DOOR FINISH

A. General: The entire finish of wood doors is work of this section, regardless of whether shop-applied or applied after installation.

1. Shop finishing: To the greatest extent possible, finish wood doors at factory or shop. Defer only final touch-up, cleaning and polishing for time after delivery and installation.

B. Preparations for finishing: Comply with WDMA I.S. 6A “Industry Standard for Architectural Stile and Rail Doors”, for sanding, sealing of concealed surfaces and similar preparations for finishing of wood doors, as applicable to each unit of work.

C. Transparent finish: Comply with requirements indicated below for filling, staining, finish and sheen.

1. Fill open grain wood with filler compatible with the finishes indicated, match color and tone of the wood being filled.

2. Finish: Manufacturer’s standard interior finish with performance requirements comparable to WDMA TR-4 Conversion Varnish or TR-8 UV-Cured Acrylated Polyester/Urethane.

a. Stain Color: Clear.

b. Sheen: As selected by the Architect

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine installed door frames prior to hanging door:

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

2. Reject doors with defects that cannot be repaired in a manner that is imperceptible. Replace doors which cannot be field repaired to match new as approved by the Contracting Officer at no additional cost to the Owner. Doors warped in excess of 1/4 inch when measured in accordance with WDMA I.S.-1A shall be rejected.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Hardware: For installation see Section 08710 - FINISH HARDWARE.

B. Manufacturer's Instructions:

1. Install wood doors to comply with manufacturer's instructions and of referenced AWS and WDMA standard SD1-105 and as indicated.

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

1. Fitting Clearances for Non-Rated Doors: Provide 1/8 inch at jambs and heads; and 1/2 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 3/8-inch clearance from bottom of door to top of threshold unless indicated for undercut.

2. Fitting Clearances for Fire-rated Doors: Comply with the more restrictive requirements of NFPA 80 and 2012 IBC as amended.

3. Bevel non-rated doors 1/8 inch in 2 inches at lock and hinge edges.

4. Bevel fire-rated doors 1/8 inch in 2 inches in lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Prefit Doors: Fit to frames for uniform clearance at each edge.

3.03 ADJUSTING AND PROTECTION

A. Operation: Rehang or replace doors which are hinge bound and do not swing or operate freely. Replace or rehang doors which are warped, twisted, or which are not in true planes.

B. Protection: Protect doors as recommended by door manufacturer to assure that wood doors will be without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 08710 - FINISH HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes:

1. Hardware for interior doors, other than hardware specified in specific door Sections.
2. Furnish and deliver to the building site, all finishing hardware required for all doors, etc., complete as indicated on Drawings and as specified.
3. It is the intent of this Specification to cover in general the class and character of all finish hardware required.
4. The hardware list specified has been made for the convenience of the Contractor and covers in general the necessary hardware for doors, casework, etc., but all other doors, etc., shown on the Drawings and not covered by the general characterization shall be fitted with appropriate hardware of the same standards as the hardware described throughout these specifications. Contractor shall furnish hardware schedule as specified.
5. Suppliers proposing substitutes of equivalent products of other than the manufacturers named shall submit schedules listing the product and manufacturer specified and the product and manufacturer of proposed substitute.

B. Related Work described elsewhere:

1. Section 06412 - ARCHITECTURAL CASEWORK

1.02 REFERENCES: The publications listed below form a part of this Specification to the extent referenced. These publications are referred to in the text by the basic designation only.

A. ADA – Department of Justice 2010 ADA Standards for Accessible Design

B. BHMA – Builders Hardware Manufacturers Association

C. NFPA 80 - Fire Doors and Windows.

D. NFPA 252 - Fire Tests of Door Assemblies.

E. SDI – Steel Door Institute

F. UL 10B - Fire Tests of Door Assemblies.

G. UL 305 - Panic Hardware.

H. NFPA 101 - Life Safety Code.

I. IBC – 2006 International Building Code

1.03 SUBMITTALS

A. Schedule: Furnish eight (8) copies of the schedule of hardware in compliance with specifications and Drawings. Schedule format shall be vertical type as listed in DHI document "Sequence and Format for the Hardware Schedule". List each opening and hardware to be applied. State materials finish, and manufacturer's number for each item. Required types are listed.

B. Manufacturer's Data: Submit manufacturer's descriptive literature along with schedule for information only.

C. Certified Test Reports: Indicate that each item listed under Hardware Items meets the standard listed for that item. A copy of the listing of proposed hardware items in the current applicable BHMA directories of certified products may be submitted in lieu of test reports.

D. Project Reference Samples: Upon delivery of finish hardware to the site, select and tag one item of each different type. Identify each item by reference publication type or number and manufacturer’s catalog number. Items shall remain on file until similar items have been installed, at which time items on file shall be installed in predetermined locations.

E. Templates: Furnish hardware templates of each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check Shop Drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.

F. Tools and Maintenance Instructions: Furnish a complete set of special wrenches, tools, maintenance instructions applicable to each different or special hardware component.

G. Certification: After completion and inspection by hardware supplier of all construction work, certify on an approved form, that all items of finish hardware have been adjusted and are working properly and that all hardware on fire rated (labeled) closures conforms to requirements of ULI.

H. Warranty: Submit warranty as stipulated in item entitled "WARRANTY" hereinbelow.

1.04 PROJECT RECORD DOCUMENTS

A. Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

1.05 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

B. The manufacturer's representative shall instruct the user's staff on the hardware's maintenance procedures (type of lubricant needed and frequency of maintenance).

1.06 QUALITY ASSURANCE

A. Perform work in accordance with Americans with Disabilities Act Accessibility Guidelines ADAAG Section 404.1, NFPA 80, "Fire Doors and Fire Windows", NFPA

101, "Life Safety Code", UL10C, "Fire Tests of Door Assemblies", NFPA 252, "Fire Tests of Door Assemblies", and ICC IBC as applicable. Each door that is an element of an accessible route shall comply with ADAAG Section 404.1 and shall be mounted no higher than 48-inches above finish floor.

B. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience. Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.

C. Hardware Supplier: Company specializing in architectural finish hardware, with a local stock warehouse, who has furnished hardware in Hawaii for a period of not less than three years.

D. Hardware Supplier Personnel: Employ an experienced Architectural Hardware Consultant (AHC), or architects approved equal, who is available at reasonable times during the course of the Work, to the Engineer and Contractor for consultation about Project's hardware requirements, to verify specified hardware with door function and hardware finishes, and to establish keying system.

E. Hardware Installer: Company specializing in the installation of architectural hardware and approved by the architect and architectural hardware consultant (AHC), or architects approved equal.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable code for accessibility and requirements applicable to fire rated doors and frames.

B. Products Requiring Electrical Connection: Listed and classified by Underwriter's Laboratories, Inc., as suitable for the purpose specified and indicated.

C. Definition: “Door Hardware" includes items known commercially as finish hardware which are required for swing and sliding doors, except special types of unique and non-matching hardware specified in same section as door and door frame.

1.08 DELIVERY, STORAGE AND HANDLING

A. Delivery, store, protect and handle products to prevent damage of any kind and to maintain security to site.

B. Inventory hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

C. Deliver individually packaged hardware items at proper times to proper locations (shop or project site) for installation.

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

E. Deliver keys to Engineer by security shipment direct from hardware supplier.

F. Provide secure lock-up for hardware delivered to project but not yet installed. Control handling and installation of hardware items which are not immediately replaceable, so that completion of the Work will not be delayed by hardware losses, both before and after installation.

1.09 COORDINATION

A. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware, and door machining for all hardware items.

1.10 WARRANTY

A. Provide one year warranty. Ten (10) years on Door Closers, with two (2) years on Electrical Components. Where longer warrant is standard with the manufacturer, furnish the longer warranty.

B. The Surety shall not be liable beyond 2 years of the Project Acceptance date.

1.11 MAINTENANCE MATERIALS

A. Provide special wrenches and tools applicable to each different or special hardware component.

B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Asbestos Prohibition: No asbestos containing material materials shall be used under this section. The Contractor shall insure that all material incorporated in the project are asbestos-free.

2.02 SCHEDULED HARDWARE

A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware is indicated in HARDWARE GROUPS at end of this section. Products are identified by using proprietary catalog numbers, and are used to establish quality and function of products desired.

B. Product numbers indicated in the HARDWARE GROUPS are those of the manufacturers listed and are used to establish the quality of products intended.

2.03 MATERIALS AND FABRICATION

A. Hand of Door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of indicated door.

B. Base Metals: Produce hardware units of basic metal and forming method specified, 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 A156 series standard for each type hardware item

and with ANSI 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. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.

D. Furnish screws for installation, with each hardware item. Provide Phillips flat head screws except as otherwise indicated. Finish exposed screws to matches hardware finish. If exposed in surfaces of other work, to match finish of such other work as closely as possible, including prepared-for-paint finish in surfaces to receive painted finish.

E. Expansion shields in concrete or masonry shall fill the depth and diameter of drilled holes.

F. Provide concealed fasteners for hardware units which are exposed when door is closed, except to the extent no standard units of the type specified are available with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed in other work, except where it is not feasible to adequately reinforce the Work. In such cases, provide sleeves for each through bolt or use sex screws fasteners.

G. Bring to the attention of the University any discrepancy between the Hardware Groups and door schedule prior to ordering.

2.04 HINGES, BUTTS AND PIVOTS

A. General: Hinges shall conform to ANSI/BHMA A156.1, pivots shall conform to ANSI/BHMA A156.4, and the requirements of this specification.

B. Templates: Except for hinges to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

C. Screws: Furnish Phillips flat head or machine screws for installation of units, except furnish Phillips flat head or wood screws for installation of units into wood. Finish screw heads to match surface of hinges or pivots.

D. Hinges Pins: Except as otherwise indicated, provide hinge pins as follows:

1. Nonferrous Hinges: Stainless steel pins.
2. Interior Doors: Nonrising pins.
3. Tips: Flat button and matching plug, finished to match leaves.

E. Number of Hinges: Provide number of hinges in accordance with BHMA A 156.1 but not less than 3 hinges for door leaf for doors 90 inches or less in height and one additional hinge for each 30 inches of additional height.

F. Size of hinges shall be as follows:

Door Thickness / Width	Hinge Height	Hinge Width
1-3/4 inch to 36 inches	4-1/2 inch	4 or 4-1/2 inch
1-3/4 inch over 36 inches	5-inch	4-1/2 Extra Heavy Ball Bearing

1-3/4 inch over 48 inches	5-inch	4-1/2 Extra Heavy Ball Bearing

2.05 LOCK CYLINDERS AND KEYING

A. Lock cylinders shall be ASSA high security key system, 6 pin tumblers to match University of Hawaii Manoa ASSA system. The lock cylinders shall be master-keyed to the University ASSA high security key system as directed by the University.

B. Provide no more than ten (10) keys per lockset; exact quantity to be determined during keying schedule. Stamp all keys “University of Hawaii do not duplicate.”

C. Upon acceptance of the project, the contractor shall arrange for temporary keys from HHSC if further access is required.

2.06 LOCKS, LATCHES AND BOLTS

A. General: Mortise locks and latches shall conform to ANSI/BHMA A156.13, Grade 1, bored locks and latches shall conform to ANSIIBHMA A 156.2, bolts shall conform to ANSI/BHMA A156.16, ADAAG Section 404.2.7, and the requirements of this specification

B. Mortise Locksets shall be manufactured in a single sized case formed from 12 gauge minimum steel. The case shall be closed on all sides and back. The lockset shall have a field-adjustable, beveled armored front, with a 0.125-inch minimum thickness.

C. Mortise locksets shall have freewheeling outside levers on all exterior doors. The freewheeling lever design shall allow the lever to swing freely up to 70 degrees, when the door is locked.

D. Strikes: Provide manufacturer's standard wrought box strike for each latch of lock bolt, with curved lip extended to protect frame, finish to match hardware set. Provide dustproof strikes for foot bolts, except where special threshold construction provides non-recessed strike for bolts.

E. Lock Throw:

1. Provide 3/4-inch minimum throw of latch, and 1-inch minimum Deadbolt.

F. Flush Bolt Heads: Minimum of 1/2-inch diameter rods of brass, bronze or stainless steel, with minimum 12-inch long rod for doors up to 7 feet in height; minimum 42-inches long rod for doors up to 9'-6" in height.

G. Provide locksets, latches, and cylinders equal in all respects to those specified in the Hardware Groups. All thumb turns shall conform to ADAAG Section 404.2.7.

2.07 CLOSERS AND DOOR CONTROL DEVICES

A. Standards: Comply with BHMA A 156.4 for closers, BHMA A 156. 15 for closer holder release devices and ADAAG Section 404.2.8.1 and Section 404.2.9 and the requirements of this specification.

B. Grade: BHMA Grade1 for all closers.

C. Size of Units: Comply with manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather, and anticipated frequency of use. Where parallel arm closers are installed, provide closer unit one size larger than recommended for use with standard arms.

D. Maximum effort to operate doors shall not exceed 8.5 pounds for exterior doors and 5 pounds for interior doors, such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards. When fire doors are required, the maximum effort to operate the door may be increased not to exceed 15 pounds.

E. Surface Closers:

1. Provide parallel arm or regular arm closer as required to mount closer on door face least exposed to public traffic.

2. Closers shall have brass adjustment operating valves for closing speed, latching speed and backcheck control as a standard feature.

3. Closers shall have one piece high performance aluminum alloy body.

4. Closer covers shall be high impact non corrosive, flame retardant.

5. Closer shall not require removal for adjustments to be made.

F. Following door closers will be considered equal subject to Project conditions:

1. LCN - 4041 Series.

2. Corbin Russwin - DC6000 Series.

3. Norton - 7500 Series.

4. Sargent - 351 Series.

2.08 DOOR SEALS

A. Standard: Comply with BHMA A156.22.

B. Gasketing Materials: Comply with ASTM D 2000 and AAMA 701/702

C. Provide noncorrosive fasteners as recommended by manufacturer for application indicated.

D. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.

E. Smoke Seals: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784

1. Provide smoke-labeled gasketing on 20-minute-rated doors and on smoke-labeled doors. Provide continuous seals at each edge of door leaf.

F. Thresholds: Provide all thresholds as indicated on the door schedule conforming to ANSI/BHMA A156.21 and ADAAG Section 404.2.5.

2.09 FINISHES

A. Standard: Comply with BHMA A156.18.

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

C. Designations used are those listed in ANSI/BHMA A156.18 -American National Standards for Materials and Finishes, including coordination with traditional U.S. finishes shown by certain manufacturers for their products.

1. If no BHMA finish is established, match specified product.

D. Provide matching finishes for hardware units at each door or opening to greatest extent possible, except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where base metal or metal forming process is different for individual units of hardware exposed at same door or opening.

E. 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 for applicable units of hardware by referenced standards.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Pre-Installation Meeting: Before start of work under this contract, the Contractor, hardware installer, hardware manufacturer's representative or supplier and the University shall meet to review the hardware installation instructions and installation conditions.

B. Verify that doors and frames are ready to receive Work and dimensions are as indicated. Hardware installer must notify the architect of any conflicts prior to installing hardware.

3.02 INSTALLATION

A. Install each hardware item in compliance with manufacturer's instructions and recommendations.

B. Mount hardware units at height indicated in ANSI/SDI A250.8, "Recommended Specification for Standard Steel Doors and Frames", except:

1. As otherwise indicated or as required to comply with governing regulations or ADAAG Section 404.2.7.

2. Mount deadbolt (if any)) centerline to conform with ADAAG Section 404.2.7 above latchset handle centerline.

C. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protection with finishing work. Do not install surface mounted items until finishes have been completed on the substrate.

D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

F. Set metal thresholds for exterior doors in full bed of butyl rubber or polyisobutylene mastic sealant as specified in Section 07920 – SEALANTS.

G. Fit face of all mortise parts snug and flush.

H. Operating parts shall move freely and smoothly without binding, sticking or excessive clearance.

I. Protect hardware from damage or marring of finish during construction. Use strippable coatings, removable tapes or other approved means.

J. Ensure that hardware displays no evidence of finish paint after building cleanup with exception of prime coated hardware installed for finish painting. The Contractor may achieve this by sequencing installation, removing after fittings and reinstalling after painting is completed, providing protection, cleaning original hardware finish, or other approved means.

K. Latch and bolt: Install latch and bolt to automatically engage in keeper, whether activated by closer or manual push. In no case shall additional manual pressure be required to engage latch or bolt in keeper.

L. Closers:

1. Do not mount closers on corridor side of door except at exterior doors.

2. Carefully adjust closers to be operated noiselessly and evenly and to conform to ADAAG Section 404.2.8 and Section 404.2.9.

3. Have manufacturer's representative regulate closers prior to University's acceptance of building.

3.03 FIELD QUALITY CONTROL

A. Required certified Architectural Hardware Consultant or architects approved equal from door hardware supplier to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.04 ADJUST AND CLEAN

A. Hardware installer shall adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace items which cannot be adjusted to operate freely and smoothly as intended for application made.

B. Hardware installer shall clean adjacent surface soiled by hardware installation.

C. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, hardware installer shall return to the Work during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area:

1. Clean operating items as necessary to restore proper function and finish of hardware and doors.
2. Adjust door control devices to compensate for final operation of ventilating equipment.
3. Lubricate bearings surface of moving parts and adjust latching and holding devices for proper function.
4. Test keys for proper conformance with keying system.

3.05 HARDWARE GROUPS

MANUFACTURER LIST

CATEGORY	VENDOR NAME	MFG
ADA CLASSROOM SET	BY ACCURATE LOCK & HARDWARE CO.	ACU
ADA ENTRY SET	BY ACCURATE LOCK & HARDWARE CO.	ACU
ADA PULLS	BY ACCURATE LOCK & HARDWARE CO.	ACU
AUTO OPERATOR	BY BESAM ENTRANCE SOLUTIONS	BSM
ELECTRIC STRIKE	BY HANCHETT ENTRY SYSTEMS, INC.	HAN
ELECTRICAL HINGE	BY McKINNEY PRODUCTS COMPANY	MCK
HINGE	BY McKINNEY PRODUCTS COMPANY	MCK
AUTO. DOOR BOTTOM	BY PEMKO MANUFACTURING CO.	PEM
DOOR SEAL	BY PEMKO MANUFACTURING CO.	PEM
SPLIT ASTRAGAL	BY PEMKO MANUFACTURING CO.	PEM
INTERMEDIATE PIVOT	BY RIXSON DOOR CONTROLS	RIX
PIVOT SET	BY RIXSON DOOR CONTROLS	RIX
AUTOMATIC FLUSH BOLT	BY ROCKWOOD MANUFACTURING CO.	ROC
COORDINATOR	BY ROCKWOOD MANUFACTURING CO.	ROC
DUST PROOF STRIKE	BY ROCKWOOD MANUFACTURING CO.	ROC
FLOOR STOP	BY ROCKWOOD MANUFACTURING CO.	ROC
FLUSH BOLT	BY ROCKWOOD MANUFACTURING CO.	ROC
WALL OR FLOOR STOP	BY ROCKWOOD MANUFACTURING CO.	ROC
WALL STOP (CONVEX)	BY ROCKWOOD MANUFACTURING CO.	ROC
CLASSROOM LOCK	BY SARGENT MANUFACTURING COMPANY	SAR
CONCEALED O.H.STOP	BY SARGENT MANUFACTURING COMPANY	SAR
DOOR CLOSER	BY SARGENT MANUFACTURING COMPANY	SAR
ELEC RIM EXIT DEVICE	BY SARGENT MANUFACTURING COMPANY	SAR
ENTRY LOCK	BY SARGENT MANUFACTURING COMPANY	SAR
MORTISE CYLINDER	BY SARGENT MANUFACTURING COMPANY	SAR
PASSAGE SET	BY SARGENT MANUFACTURING COMPANY	SAR
PRIVACY SET	BY SARGENT MANUFACTURING COMPANY	SAR
RIM EXIT DEVICE	BY SARGENT MANUFACTURING COMPANY	SAR
HANGER	BY DORMAKABA USA, INC.	STA
POCKET DOOR SET	BY DORMAKABA USA, INC.	STA
ADA WALL SWITCH	BY WIKK INDUSTRIES, INC.	WIK
KEY SWITCH	BY WIKK INDUSTRIES, INC.	WIK
HALF SADDLE THRES	BY ZERO INTERNATIONAL	ZER
PERIMETER SEAL @HEAD	BY ZERO INTERNATIONAL	ZER
SLIDING AUTO DR BOT	BY ZERO INTERNATIONAL	ZER

HW GROUP - 001

3.0 EA	HINGE	T4A3386 5 X 4.5 US26D	MCK
1.0 EA	RIM EXIT DEVICE	8813 ETL US32D	SAR
		KEY AS DIRECTED.	
1.0 EA	ELECTRIC STRIKE	9600 12/24VDC 630	HAN
1.0 EA	AUTO OPERATOR	SW200i - SGL	BSM
1.0 EA	WALL STOP (CONVEX)	406 630	ROC
2.0 EA	ADA WALL SWITCH	S-4X4-3-US32D	WIK
1.0 EA	KEY SWITCH	S-SG-KEY1MAIN-US32D	WIK

HW GROUP - 002

5.0 EA	HINGE	T4A3386 5 X 4.5 US26D	MCK
1.0 EA	ELECTRICAL HINGE	QC8-T4A3386 5 X 4.5 US26D	MCK
2.0 EA	FLUSH BOLT	555 626	ROC
1.0 EA	DUST PROOF STRIKE	570 626	ROC
1.0 EA	ELEC RIM EXIT DEVICE	55-56-8813 ETL US32D X 644 STRIKE	SAR
		KEY AS DIRECTED.	
1.0 EA	AUTO OPERATOR	SW200i - SGL ACTIVE DOOR	BSM
2.0 EA	WALL STOP (CONVEX)	406 630	ROC
2.0 EA	SPLIT ASTRAGAL	29310 CS LENGTH AS REQUIRED	PEM
2.0 EA	ADA WALL SWITCH	S-4X4-3-US32D	WIK
1.0 EA	KEY SWITCH	S-SG-KEY1MAIN-US32D	WIK

HW GROUP - 003

1.0 EA	PIVOT SET	L147 US26D 3/4"	RIX
1.0 EA	INTERMEDIATE PIVOT	ML19 US26D	RIX
1.0 EA	PASSAGE SET	28-74-10U15 LL US26D WBX	SAR
1.0 EA	DOOR CLOSER	74-351 O EN LEAD LINED COVER	SAR
1.0 EA	WALL STOP (CONVEX)	406 630	ROC
1.0 EA	DOOR SEAL	S773D LENGTH AS REQUIRED	PEM
1.0 EA	AUTO. DOOR BOTTOM	411ARL LENGTH AS REQUIRED	PEM

HW GROUP - 004

3.0 EA	HINGE	TA2314 4.5 X 4.5 US26D	MCK
1.0 EA	CLASSROOM LOCK	28-10G37 LL US26D WBX	SAR
		KEY AS DIRECTED.	
1.0 EA	WALL STOP (CONVEX)	406 630	ROC

HW GROUP - 005

3.0 EA	HINGE	TA2314 4.5 X 4.5 US26D	MCK
1.0 EA	ENTRY LOCK	28-10G24 LL US26D WBX	SAR
		KEY AS DIRECTED.	

1.0 EA	WALL STOP (CONVEX)	406 630	ROC
1.0 EA	DOOR SEAL	S773D LENGTH AS REQUIRED	PEM
1.0 EA	AUTO. DOOR BOTTOM	411ARL LENGTH AS REQUIRED	PEM

HW GROUP - 006

1.0 EA	POCKET DOOR SET	PDFC150N-00-70	STA
1.0 PR	HANGER	BP250N-41 (1PR)	STA
1.0 PR	ADA PULLS	7200P US26D BTB	ACU
1.0 EA	FLOOR STOP	441H 626 TO KEEP DOOR 4" OUT OF POCKET	ROC

HW GROUP - 007

1.0 EA	PIVOT SET	L147 US26D 3/4"	RIX
1.0 EA	INTERMEDIATE PIVOT	ML19 US26D	RIX
1.0 EA	PASSAGE SET	28-74-10U15 LL US26D WBX	SAR
1.0 EA	DOOR CLOSER	74-351 O EN LEAD LINED COVER	SAR
1.0 EA	WALL OR FLOOR STOP	406 630 / 441H 626 AS REQUIRED	ROC

HW GROUP - 008

6.0 EA	HINGE	TA2314 3.5 X 3.5 US26D	MCK
2.0 EA	FLUSH BOLT	555 626	ROC
1.0 EA	DUST PROOF STRIKE	570 626	ROC
1.0 EA	CLASSROOM LOCK	1-28-10G37 LL US26D WBX KEY AS DIRECTED.	SAR
2.0 EA	CONCEALED O.H.STOP	1537 S US26D (25-1/8" - 32-1/2")	SAR

HW GROUP - 009

2.0 EA	PIVOT SET	L147 US26D 3/4"	RIX
2.0 EA	INTERMEDIATE PIVOT	ML19 US26D	RIX
1.0 EA	AUTOMATIC FLUSH BOLT	2840 626 (TOP ONLY)	ROC
1.0 EA	PASSAGE SET	28-74-10U15 LL US26D WBX	SAR
1.0 EA	COORDINATOR	1700 628	ROC
2.0 EA	DOOR CLOSER	74-351 O EN LEAD LINED COVER	SAR
2.0 EA	WALL OR FLOOR STOP	406 630 / 441H 626 AS REQUIRED	ROC
1.0 EA	DOOR SEAL	S773D LENGTH AS REQUIRED	PEM
2.0 EA	AUTO. DOOR BOTTOM	411ARL LENGTH AS REQUIRED ASTRAGAL BY DOOR MANUFACTURER.	PEM

HW GROUP - 010

3.0 EA	HINGE	TA2314 4.5 X 4.5 US26D	MCK
1.0 EA	PRIVACY SET	V54-8265 LNL US26D WBX	SAR
1.0 EA	DOOR CLOSER	1431 UO EN	SAR
1.0 EA	WALL STOP (CONVEX)	406 630	ROC

HW GROUP - 011

1.0 EA	PIVOT SET	L147 US26D 3/4"	RIX
1.0 EA	INTERMEDIATE PIVOT	ML19 US26D	RIX
1.0 EA	PRIVACY SET	V54-74-8265 LNL US26D WBX	SAR
1.0 EA	DOOR CLOSER	74-351 O EN LEAD LINED COVER	SAR
1.0 EA	WALL OR FLOOR STOP	406 630 / 441H 626 AS REQUIRED	ROC

HW GROUP - 012

1.0 EA	POCKET DOOR SET	PDFC150N-00-70	STA
1.0 PR	HANGER	BP250N-41 (1PR)	STA
1.0 EA	ADA CLASSROOM SET	9100ADAL-3ST US26D	ACU
1.0 EA	MORTISE CYLINDER	41 US32D KEY AS DIRECTED.	SAR
1.0 EA	FLOOR STOP	441H 626 TO KEEP DOOR 4" OUT OF POCKET	ROC

HW GROUP - 013

1.0 EA	POCKET DOOR SET	PDFC150N-00-70	STA
1.0 PR	HANGER	BP250N-41 (1PR)	STA
1.0 EA	ADA ENTRY SET	9100ADAL-3 US26D	ACU
1.0 EA	MORTISE CYLINDER	41 US32D KEY AS DIRECTED.	SAR
1.0 EA	FLOOR STOP	441H 626 TO KEEP DOOR 4" OUT OF POCKET	ROC
2.0 EA	PERIMETER SEAL @HEAD	381A LENGTH AS REQUIRED	ZER
1.0 EA	SLIDING AUTO DR BOT	7350AA LENGTH AS REQUIRED	ZER
2.0 EA	HALF SADDLE THRES	627A LENGTH AS REQUIRED	ZER

HW GROUP - 014

3.0 EA	HINGE	TA2314 4.5 X 4.5 US26D	MCK
1.0 EA	PASSAGE SET	28-10U15 LL US26D WBX	SAR
1.0 EA	DOOR CLOSER	1431 O EN	SAR
1.0 EA	WALL OR FLOOR STOP	406 630 / 441H 626 AS REQUIRED	ROC
1.0 EA	DOOR SEAL	S773D LENGTH AS REQUIRED	PEM
1.0 EA	AUTO. DOOR BOTTOM	411ARL LENGTH AS REQUIRED	PEM

END OF SCHEDULE

END OF SECTION

DIVISION 09 - FINISHES

SECTION 09125 – INTERIOR RESIN PANELS AND PARTITION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Interior resin panel partition system with pre-finished aluminum framed module system with top, bottom and wall channels to receive 1/2-inch resin panel infill as scheduled.

1.02 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each product specified.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of components indicating frame types, profiles, methods and locations of anchoring, glazing requirements, hardware locations and reinforcements for hardware.

C. Samples:

1. For each type of exposed finish required, prepared on samples of manufacturer's standard sizes and of same thickness and material indicated for the work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.

2. Wall and Infill Panel: For each type of wall and infill panel provide three 12-inch square samples.

D. Installation Instructions: Provide copies of manufacturer’s data for fabrication and installation of resin panel partitions.

1.03 QUALITY ASSURANCE

A. Comply with governing codes and regulations.

B. Manufacturer Qualifications: A firm experienced in manufacturing interior resin panel partition systems similar to those indicated for this project and with a record of successful in-service performance.

C. Installer Qualifications: An experienced installer who has completed interior resin panel partition systems similar in material, design, and extent to those indicated for this project and whose work has resulted in construction with a record of successful in-service performance.

D. Source Limitations: Obtain all components of the interior resin panel partition system through one source from a single manufacturer with the capacity and resources to provide products of consistent quality in appearance and physical properties.

E. Design Requirements: Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed,

submit comprehensive explanatory data to Architect for review.

F. Performance Requirements: Fabricate and install interior resin panel partition system to withstand and resist the loads to which they are subjected to but not less than a horizontal load of 5 psf.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver system components packaged in protective wrap within cartons and labeled.

B. Inspect components on delivery for damage. Minor damages may be repaired provided refinished items match new work and are approved by Architect, otherwise, remove and replace damaged items as directed.

C. Store components at building site under cover and as near as possible to final installation location. Do not use covering material that will cause discoloration of aluminum or resin panel finish.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: Do not install interior resin panel partitions until wet work in spaces is complete and dry, flooring, walls, ceilings, and work above ceilings is complete and ambient temperature and humidity conditions are maintained at the levels indicated for project when occupied for its intended use.

B. Field Measurements: Verify interior resin panel partition dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1.06 WARRANTY

A. Manufacturer warrants product to be free of defects in material and workmanship for 2 year from the date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURER'S

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

1. 3Form, Inc.

2. or Approved Equal.

2.02 MATERIALS

A. Aluminum shall be extruded from alloy billets of 6063-T5, complying with ASTM B 221.

B. Fasteners: Provide fasteners of aluminum, stainless steel, or other non-corrosive

materials compatible with aluminum components, hardware and anchors in accordance with ASTM A 164.

C. Glazing Gaskets: Shall be dark grey rubber gaskets designed to be installed in slots provided in extrusions.

D. Resin Partition Panel **(RP-01):** Engineered polyester resin panel, Class A impact rating in accordance with ANSI Z97.1-2004, sizes, color, finish and design as indicated on the Drawings.

1. Basis-of-Design Product: 3Form; Varia.

2.03 COMPONENTS

A. Modular frame system, attached at the floor/bottom, ceiling/top and wall, with one exposed edge

1. Provide manufacturer's matching end caps for exposed edge conditions.

B. Hardware:

1. Manufacturer's pivoting wedge insert for holding panels in the channel.

2. Retaining clip and stop block for specified panel thickness.

2.04 FABRICATION

A. Fabricate interior resin panel partition in sizes indicated with tongue and groove vertical edges for tight strong seams. Include a complete system for assembling components and anchoring doors.

B. Fabricate frame assemblies with joints straight and tight fitting.

2.05 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify dimensions, levelness of top and bottom substrates, and clearances.

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

3.02 INSTALLATION

A. Comply with resin panel partition manufacturer's printed installation instructions and approved shop drawings.

B. Install interior resin panel partitions level, plumb, square, true to line, without distortion, warp or rack of channels and panels, anchored securely in place to

structural support, and in proper relation to adjacent construction.

C. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials according to ASTM E 2112, Section 5.12 "Dissimilar Materials."

3.03 ADJUSTING, CLEANING AND PROTECTION

A. Clean aluminum surfaces immediately after resin panels. Comply with manufacturer's written recommendations for final cleaning and maintenance. Avoid damaging protective coatings and finishes. Remove nonpermanent labels, and clean surfaces.

B. Protect interior resin panel partition system surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact partition system surfaces, remove contaminants immediately according to manufacturer's written instructions.

C. Refinish or replace interior resin panel partitions with damaged finishes.

D. Touch up marred areas so that touch-up is not visible from a distance of 4 feet. Remove and replace frames that cannot be satisfactorily adjusted.

END OF SECTION

SECTION 09250 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Includes: Gypsum board work including, but not limited to, the following:

1. Gypsum board on metal framing and furring.
2. Non-load bearing metal stud framing for board.
3. Metal ceiling suspension system.

B. Related Work Described Elsewhere:

1. Wood blocking for interior work is provided under Section 06100 – ROUGH CARPENTRY.

1.02 QUALITY ASSURANCE

A. Fire Resistive Design: The construction shall comply with the applicable provisions of 2012 IBC, including all local amendments thereto and shall have been tested according to ASTM E 119 by an independent testing and inspecting agency acceptable to the authorities having jurisdiction. Installation and materials shall be in strict accordance with the above mentioned code.

1. The Fire Resistant Design shall be as indicated from UL's "Fire Resistance Directory", FM's "Approval Guide, Building Products", GA-600 "Fire Resistance Design Manual", or as listed otherwise

B. Industry Standard: Comply with applicable requirements of GA 216 "Application and Finishing of Gypsum Board" and GA 214, "Recommended Specification: Levels of Gypsum Board Finish" by the Gypsum Association, except where more detailed or more stringent requirements are indicated including the recommendations of the manufacturer.

C. Transverse Loading: The non-load bearing metal framing shall be capable of carrying a transverse load of 5 psf without exceeding the allowable stress or a deflection of L/360. Increase stud gauge, decrease stud spacing, or provide hidden from view lateral bracing to comply with these requirements at no additional cost to the Owner.

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

E. Gypsum Board Terminology: Refer to ASTM C 11, "Terminology Relating to Gypsum and Related Building Materials and Systems", for definition of terms for gypsum board assemblies not defined in this Section or in referenced standards.

1.03 SUBMITTALS

A. Submit under the provisions of Section 01330 – SUBMITTAL PROCEDURES.

B. Manufacturer's Data: Material description and manufacturer's recommended installation procedures for each material.

C. Shop Drawings: Submit shop drawings indicating fabrications and location of control and expansion joints including plans, elevations, sections, details and attachment to adjoining work. Submit setting drawings for backing plates and anchors.

D. Material Safety Data Sheets (MSDS): Submit MSDS for each product.

1.04 PRODUCT HANDLING

A. Deliver gypsum wallboard materials in sealed containers and bundles, fully identified with manufacturer's name, brand, type and grade; store in a dry well ventilated space, protected from the weather, under cover and off the ground. Stack gypsum panels flat to prevent sagging. Joint materials shall be stored in accordance with manufacturer's printed instructions. Damaged or deteriorated materials shall be removed from jobsite.

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

PART 2 - PRODUCTS

2.01 MATERIALS

A. Asbestos Prohibition: No asbestos containing materials or equipment shall be used in this section. The Contractor shall ensure that all materials and equipment incorporated in the project are asbestos-free.

B. General: Provide gypsum board panels in maximum lengths and widths available that will minimize joints and correspond with the applicable support system.

C. Gypsum Wallboard: ASTM C 1396/C 1396M "Gypsum Wallboard", 5/8 inch unless specifically noted as 1/2-inch thick, tapered edge type, 48 inches wide, Type "R" regular for all non-rated walls and Type "X" (Special Fire Retardant) for fire rated partitions and elsewhere as indicated.

D. Water Resistant Board: ASTM C 1396/C 1396M, Type "WR" water-resistant backing board, 5/8-inch thick unless indicated otherwise, with tapered edges, 48 inches wide, unless indicated otherwise (for walls only). Provide Type "WR-X" (Special Fire Retardant) for fire rated partitions.

E. Tile Backer Unit: ASTM C 1178 "Glass Mat Water-Resistant, Gypsum Backing Board", glass mat reinforced gypsum backer board, nominal 5/8-inch-thick, for hard tile backing, equal to Dens-Shield by Georgia Pacific. Provide tape and joint compound materials as recommended by manufacturer.

F. Wallboard Fasteners: ASTM C 1002 "Steel Drill Screws for the Application of Gypsum or Metal Plaster Bases", standard bugle head self-drilling, self-tapping corrosive-resistant drywall screws, Screws used in fire-resistive rated construction shall be of type approved for use by governing building code. Screws for structural studs shall conform to ASTM C 954 "Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs from 0.033 inch (0.84 mm) to 0.112 inch (2.84 mm) in Thickness".

G. Joint Treatment Materials: ASTM C 475 “Joint Compound and Joint Tape for Finishing Gypsum Board”, materials for treating joints and fastener heads shall be as manufactured or recommended by the Manufacturer of the wallboard used. Provide “setting” type joint compound that is unaffected by humidity for water resistant board.

1. Tile Backer Board Joint Treatment:

a. Joint Compound: Same material specified in Section 09310 – CERAMIC TILE used to thinset tile to the backer board or type recommended by manufacturer for the application indicated.

b. Sealant: (**JS-06**) One-part mildew-resistant silicone, sealant conforming to ASTM C 920 as specified in Section 07920 – SEALANTS.

H. Non-Load Bearing Studs: Comply with ASTM C 754 for conditions indicated. ASTM C 645 “Non-Load (Axial) Bearing Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board”, studs shall be 1-5/8, 2-1/2, 3-5/8, and 6 inches unless indicated otherwise on the drawings. Studs shall be rolled formed channel of 25, and 20 gauge galvanized steel, ASTM A 653 “Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process”, G60 coating. Provide holes and notches for conduit or electrical wiring.

I. Tracks: Metal floor and ceiling tracks shall be rolled formed channel of gauge electro-zinc plated steel of same gauge as stud with width dimensions suitable to corresponding stud sizes indicated on the drawings.

J. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; same gauge as stud and in width to accommodate depth of studs. The U-shape track is 2-1/2-inches deep and has 1-1/2-inches vertical slots spaced 1” along both legs and is fabricated from hot-dipped galvanized steel complying with ASTM A653.

K. Furring Channels: ASTM C 645, hat-shaped, 7/8 inch deep, hot-dipped galvanized, 25 gauge.

L. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch, depth of 1-1/2-inch and minimum 1/2-inch-wide flanges.

M. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on partition or shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

1. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing according to ASTM E 1190 conducted by a qualified testing agency.

a. Products: Subject to compliance with the requirements, provide power actuated fasteners with top hat or washer to for larger bearing surface against track and increased resistance to pullover as manufactured by one of the following:

1) ITW Ramset

2) Hilti

3) Powers

4) or Approved Equal

N. Ceiling Support Materials and Systems:

1. General: Size ceiling support components to comply with ASTM C 754 “Installation of Steel Framing Members to Receive Screw-Attached Gypsum” unless indicated otherwise.

2. Direct Suspension Systems: Manufacturer’s standard zinc-coated or painted steel system of furring runners, furring tees, and accessories designed for concealed support of gypsum drywall ceilings; of proper type for use intended. System Manufacturer: Equal to one of the following:

a. Armstrong World Industries, Inc

b. Chicago Metallic Corp

c. USG Interiors, Inc.

3. Wire for Hangers and Ties: ASTM A 641/A 641 M “Zinc-Coated (Galvanized) Carbon Steel Wire”, Class 1 zinc coating, soft temper, 8 gauge for hangers supporting up to 12.5 square feet and 6 gauge where supporting up to 16 square feet and 18 gauge for ties.

O. Wallboard Accessories: ASTM C 1047 “Accessories for Gypsum Wallboard and Gypsum Veneer Base”, Vinyl Corp., Plastic Components Inc., Vinyl Tech or approved equal.

1. Standard Corner Bead: Vinyl Corp. Corner Bead CB 125 at all outside corners of wall, ceiling, and soffit as indicated.

2. Casing Trim: Vinyl Corp. “L” Bead SB 58, “J” Bead MJB5B, or approved equal as indicated.

3. Control Joint: Vinyl Corp. CJV 16 or approved equal.

4. Other Accessories: As indicated or necessary for complete installation.

5. Alt accessories shall be vinyl, PVC, or approved equal.

P. Joint Treatment Materials: ASTM C 475; type recommended by manufacturer for the application indicated, except as otherwise noted. Perforated tape, and joint and topping compound, or “all-purpose” compound.

Q. Laminating Adhesive: Special adhesive or joint compound specifically recommended for laminating gypsum boards.

PART 3 - EXECUTION

3.01 EXAMINATION

Examine substrates to which drywall construction attaches or abuts, preset hollow metal frames, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting

performance of drywall construction. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General: Comply with ASTM C 840 “Application and Finishing of Gypsum Board”, Gypsum Association GA 216 and ASTM C 754 as applicable to the type of substrate and drywall support system indicated.

B. Tolerances:

1. Maximum variation of finish surface from true flatness shall be 1/8-inch in 10-feet in any direction unless specified otherwise.

2. Maximum variation of plumbness of wall shall be 1/8 inch in 10 feet of height.

3. Maximum variation from true position shall be 1/8 inch.

C. Ceiling Support Suspension Systems:

1. Secure hangers to structural support by connecting directly to structure where possible, otherwise connect to inserts, clips or other anchorage devices or fasteners as indicated. Ensure that structural anchorage provisions have been installed to receive ceiling anchors in a manner that will develop their full strength and at spacing required to support ceiling.

2. Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.

3. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

5. Secure hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.

6. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.

7. Sway brace ceiling to conform to the applicable seismic zone and uplift, applicable requirements of ASTM E 580, “Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint”, and the manufacturer’s recommendations.

8. Space main runners 4 feet on center and space hangers 4 feet on center along runners, except as otherwise shown.

9. Level main runners to a tolerance of 1/8 inch in 12 feet, measured both lengthwise on each runner and transversely between parallel runners.

10. Wire-tie or clip furring members to main runners and to other structural supports as indicated or as recommended by the manufacturer.

11. Direct-hung Metal Support System: Attach perimeter wall track or angle wherever support system meets vertical surfaces. Mechanically join support members to each other and butt-cut to fit into wall track.

12. Space furring member 16 inches on center, except as otherwise indicated.

13. Install auxiliary framing at termination of drywall work, and at openings for light fixtures and similar work, as required for support of both the drywall construction and other work indicated for support thereon.

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

15. Keep hangers and braces 2 inches clear of ducts, pipes and conduits.

D. Non-Load Bearing Metal Wall Framing:

1. Install supplementary framing, blocking and bracing to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings and similar work which cannot be adequately supported on gypsum board alone to comply with details indicated and with recommendations of gypsum board manufacturer, or if none available, with “Gypsum Construction Handbook” published by United States Gypsum Co.

2. Isolate stud system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.

3. Install runner tracks at floors, ceilings and structural walls and columns where gypsum drywall stud system abuts other work, except as otherwise indicated.

4. Space studs and furring 16 inches on center, except as otherwise indicated.

5. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.

6. Install 20 gauge studs spaced at 16-inches on center in walls scheduled to receive ceramic or stone tile and in walls that support wall cabinets and shelving.

7. Frame door openings with vertical studs securely attached by screws at each jamb either directly to frames or to jamb anchor clips on door frame in accordance with door manufacturer’s recommendations; install runner

track sections (for jack studs) at head and secure to jamb studs. Provide runner tracks of same gauge as jamb studs. Space jack studs same as partition studs.

8. Install 20 gauge studs at each jamb for all doors 2'-8" wide to 4 feet wide weighing not more than 200 pounds; and for all doors less than 2'-8" wide weighing more than 100 pounds but not more than 200 pounds.

9. Install double 20 gauge studs for single doors up to 4 feet wide, weighing more than 200 pounds but not more than 300 pounds; screw attach web of back-to-back studs direct to jamb anchor clips nested between flange of stud.

10. Frame openings other than door openings in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.

11. Install each steel framing and furring member so that fastening surface does not vary more than 1/8-inch from plane of faces of adjacent framing.

E. Gypsum Wallboard, General:

1. Locate exposed end-butt joints as far from center of walls and ceilings as possible.

2. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16 inch open space between boards. Do not force into place.

3. Locate either edge or end joints over supports, except in horizontal applications or where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that both tapered edge joints abut, and mill-cut or field-cut end joints abut. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

4. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

5. Attach gypsum board to framing and blocking as required for additional support at openings and cutouts.

6. Cover both faces of stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls which are properly braced internally. Except where concealed application is required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 square foot area, and may be limited to not less than 75 percent of full coverage.

7. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4 inch to 3/8 inch space and trim edge with J-type semi-finishing edge trim. Seal joints with acoustical sealant.

8. Space fasteners in gypsum boards in accordance with referenced standards and manufacturer's recommendations, except as otherwise indicated.

9. Install insulation at framing as indicated. Size insulation to width of members spacing. Press friction fit insulation between members as recommended by the insulation manufacturer. Insulation is provided under Section 07210 - BUILDING INSULATION.

10. Tile Backer Unit: Install tile backer units in accordance with manufacturer's instructions and TCA methods specified in Section 09310 – CERAMIC TILE.

F. Methods of Gypsum Wallboard Application:

1. On ceilings, apply gypsum board prior to wall/partition board application, to greatest extent possible and at right angle to framing, unless otherwise indicated.

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

3. Single-Layer Application:

a. On partitions/walls higher than 8'-1", apply gypsum board vertically (parallel), unless otherwise indicated, and provide sheet lengths which will minimize end joints.

b. On partitions/walls 8'-1" or less in height apply gypsum board horizontally (perpendicular); use maximum length sheets possible to minimize end joints.

4. Single-Layer Fastening Method: Apply gypsum boards to supports by fastening with screws, spaced not to exceed 16-inch centers for walls and 12 inch centers for ceilings.

5. Gypsum wallboard construction for fire rated and acoustical rated assemblies shall be in accordance with the design number indicated or if not indicated in accordance with 2003 IBC.

6. Multi-Layer Application on Partitions/Walls: Apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints.. Stagger joints on opposite sides of partitions.

G. Installation of Trim Accessories:

1. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, attach trim in accordance with manufacturer's instructions and recommendations.

2. Install corner beads at external corners.

3. Install edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed. Provide type with face flange to receive joint compound except where semi-finishing type is indicated. Install L-type trim where work is tightly abutted to other work, and install special kerf-type where other work is kerfed to receive long leg of L-type trim. Install U-type

trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).

4. Install J or LC-type semi-finishing trim where indicated.

5. Install control joints where indicated or necessary in large ceiling and wall expanses. Use door header to ceiling or floor to ceiling in long partitions and wall furring runs and from wall to wall in large ceiling areas. Where joint will be conspicuous, obtain approval prior to installation.

H. Acoustical Rated Assemblies: Seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM E 497, "Installing Sound-Isolating Gypsum Board Partitions", ASTM C 919, "Use of Sealants in Acoustical Applications", and manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.

3.03 DRYWALL FINISHING

A. General: Apply treatment at gypsum board joints (both directions), flanges of trim accessories, penetrations, fasteners heads, surface defects and elsewhere in accordance with ASTM C 840 and Gypsum Association GA 216 and GA 214 as required to prepare work for decoration. Prefill open joints, rounded or beveled edges, and damaged surfaces using type of compound recommended by manufacturer.

1. Apply joint tape at joints between gypsum boards, except where a trim accessory is indicated that does not require tape.

2. Apply joint compound in 3 coats (not including prefill of openings in base), and sand between last 2 coats and after last coat. Fastener heads, dents, gouges, and cut-outs shall be filled with joint compound and sanded.

3. Accessories at exposed joints, edges, corners, openings, and similar locations shall be taped, floated with joint compound, and sanded to produce surfaces ready for gypsum board finishes.

4. Treatment for water-resistant gypsum wallboard shall be as recommended by the gypsum wallboard manufacturer.

B. Finish interior gypsum wallboard by applying the following levels of gypsum board finish in accordance with GA-214.

1. Level 1: For ceiling plenum areas and other concealed areas.

2. Level 2: Where wall panels form substrates for tile.

3. Level 4: For ceiling surfaces to receive flat paint and wall surfaces to receive an eggshell finish and wall surfaces to receive all grades of wall covering.

4. Level 5: For wall and ceiling surfaces to receive semi-gloss enamel.

5. Where Level 5 gypsum board finish is indicated, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories; and apply

a thin, uniform skim coat of joint compound over entire surface. For skim coat, use joint compound specified for third coat, or a product specially formulated for this purpose and acceptable to gypsum board manufacturer. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects, tool marks, and ridges and ready for decoration.

6. For Level 4 gypsum board finish, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration.

7. Where Level 3 gypsum board finish is indicated, embed tape in joint compound and apply first and fill (second) coats of joint compound.

8. Where Level 2 gypsum board finish is indicated, embed tape in joint compound and apply first coat of joint compound.

9. Where Level 1 gypsum board finish is indicated, embed tape in joint compound.

3.04 BACKING PLATES AND ANCHORS

Backing plates and anchors or blocking which are to be attached to studs or furring for anchoring items and work indicated on the drawings or specified in other Sections shall be installed and secured. Plates and anchors shall be welded or fastened in place in accordance with approved setting drawings

3.05 CLEANING AND REPAIRING

After installation and before painting, correct surface damage and defects. Leave surface clean and smooth, satisfactory to the painter. painting shall be done over gypsum board work until the joints are thoroughly dry. Joints and fastenings are to be invisible after painting.

END OF SECTION

SECTION 09310 - CERAMIC TILE

PART 1 - GENERAL

1.01 SUMMARY

A. Work Includes: Complete all tile, accessories, and related work as indicated or required by drawings and as specified herein.

B. Related Work Described Elsewhere:

1. Sealants are specified under Section 07920 - SEALANTS.
2. Tile Backer Board specified in Section 09250 – GYPSUM BOARD ASSEMBLIES.
3. Tile Waterproofing specified in Section 09340 – TILE WATERPROOFING

1.02 CODES AND STANDARDS

A. The work of this section shall comply with the latest edition of the following standards. When conflicts arise between standards, the more stringent shall apply.

1. ANSI - American National Standards Institute
   a. ANSI A 108.5 – Installation of Ceramic Tile with Dry-Set Portaland Cement Mortar or Latex-Portland Cement Mortar.
   b. ANSI A 108.10 – Installation of Grout in Tilework
   c. ANSI A 118.4 – American National Standards Specifications for Latex-Portland Cement Mortar
   d. ANSI A 118.7 – American National Standards Specifications for High Performance Cement Groutsfor Tile Installation.
   e. ANSI A 137.1 - American National Standards Specifications for Ceramic Tile.
2. ASTM – American Society for Testing and Materials
   a. ASTM C 794 – Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants
   b. ASTM C 920 – Standard Specification for Elastomeric Joint Sealants
3. ADAAG – Americans with Disabilties Act Accessibility Guidelines
   a. ADAAG Section 404.3.3 – Thresholds
4. TCNA – Tile Council of North America
   a. TCNA handbook for Ceramic, Glass, and Stone Tile Installation

1.03 SUBMITTALS

A. Submit under the provisions of Section 01330 – SUBMITTAL PROCEDURES.

B. Manufacturer’s Data: Submit manufacturer’s technical information and installation instructions for selected tile, grout, waterproofing, and sealer materials.

C. Qualification Data: For Installer and Manufacturer.

D. Samples:

1. Tiles: Submit 4 each samples of various tiles and accessories required to the Architect for approval and for color and pattern selection. Identify samples as to grade and manufacturer. Submit samples of selected tile and color required, not less than 12 inch square, mounted on plywood or hardboard backing, with selected colored grout. Include two or more units in each set of samples showing the full range of appearance characteristics to be expected in completed work.

2. Backer Board: 12-inch square

E. Certificate: Before installation of tile, submit to the Architect the Standard Form of Master Grade Certificate signed by the Contractor and Manufacturer, stating grade and kind of tile.

F. Sealant Compatibility Test Report: From sealant manufacturer, complying with requirements in Section 07920 - SEALANTS and indicating that sealants will not stain or damage tile.

G. Warranty: Warranty for a minimum of 1 year against defects resulting from the use of defective or inferior materials, equipment or workmanship.

H. Maintenance Data: For ceramic and stone tile to include in maintenance manuals. Include Product Data for stone-care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

I. Installation Specifications: Submit manufacturer's installation specifications.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate ceramic and stone tiles similar in material, design, and extent to that indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Installer Qualifications: An installer who has completed ceramic tile and stone work similar in material, design, and extent to that indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

C. Source Limitations for Other Materials: Obtain each type of grout, tile accessories, sealant, and other material from a single manufacturer for each product.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver all packages of tile to the job in sealed cartons bearing grade seals in compliance with ANSI A 137.1.

B. Protect tile, mortar materials and accessories during storage and construction against moisture, soiling, staining, and physical damage.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of construction to receive tile products by field measurements indicate measurements on Shop Drawings.

B. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.07 EXTRA MATERIALS

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

B. Floor and Wall Tile: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Ceramic Wall and Floor Tiles (**CT-** designation on the Drawings): Standard grade, complying with ANSI A 137.1. Submit test reports, from an independent laboratory, indicating conformance of the tile to ANSI A137.1 upon request by the Architect.

1. Slip Resistance: Floor tiles without abrasive content: Dynamic Coefficient of Friction (DCOF) AcuTest value shall not be less than 0.42 in accordance to ANSI A 137.1.

2. Ceramic Floor, Wall Tile and Trims: Dust-pressed, white non-vitreous body with cushion or semi-cushion edges in sizes and finishes as scheduled.

3. Porcelain Tile: Porcelain wall and floor tile and trim shall be unglazed or glazed in size and finish as scheduled.

4. Trim Units: For each type of tile provide all trim shapes as detailed and/or as required. External corners shall be rounded convex unless otherwise noted in details. Provide other shapes such as curbs, beads, shoes, round out corners and square in corners, etc. to achieve a neat complete installation.

2.02 SETTING MATERIALS

A. Mortar Bed: Portland Cement Mortar, ANSI 108.02 and as specified below:

1. Portland Cement: ASTM C 150, Type I or II.

2. Aggregate: ASTM C 144.

3. Cleavage Membrane: Polyethelene sheeting, ASTM D 4397, 4.0 mils thick.

4. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2-inches by 0.062-inch diameter, comply with ASTM A 185 and ASTM A 82 except for minimum wire size

B. Bond Coat and Thin-Set Mortar: Latex-Portland cement mortar, ANSI A118.4, with manufacturer's standard latex additive (water emulsion) serving as a replacement for part or all of gauging water.

C. Large Heavy Tile (LHT), Latex-Portland Cement Mortar: Provide large heavy tile mortar for floor tiles have at least on side dimension greater than 15-inches. Comply with requirements in ANSI A118.4. Provide product that is approved by manufacturer for application thickness of 3/8 inch minimum.

D. Water: Fresh, clean and drinkable.

2.03 GROUTING MATERIALS

A. Colors as indicated by **GT-** designation on the Drawings.

1. Polymer-Modified Tile Grout: ANSI A118.7 composed of Portland cement, graded aggregates, polymers and color-fast pigments.

a. Sanded Grout for joints from 1/8-inch to 1/2-inch.

b. Un-Sanded Grout for joints less than 1/8-inch.

2.04 SEALANTS

A. Joint Sealants: Manufacturer's standard sealants of characteristics indicated below that comply with applicable requirements in Section 07920 – SEALANTS and will not stain the stone they are applied to.

1. Single-component, mildew-resistant, neutral curing silicone sealant conforming to ASTM C 920 and ASTM C 794, Type S, Grade NS, Use NT, Class 25.

2. Colors: Provide colors of exposed sealants to match colors of grout in stone adjoining sealed joints, unless otherwise indicated.

2.05 MISCELLANEOUS MATERIALS

A. Stone Threshold: As scheduled.

B. Edge Trim: Edge trim shall be aluminum in sizes as indicated or required by thicknesses of materials including setting materials. Trim shall be equal to Schluter Systems Inc. components.

C. Waterproofing Memebrane: As specified in Section 09340 – TILE WATERPROOFING.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and areas where tile will be installed for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, and free from oil or waxy films and curing compounds.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.

B. Report unsatisfactory conditions to the Contractor for corrective measures; send copy of report to the Architect. Do not proceed with installation until unsatisfactory conditions have been corrected. Proceeding with tile work will imply acceptance of the substrate condition by the ceramic tile contractor.

3.02 PREPARATION

A. Remove coatings that are incompatible with tile-setting materials from substrates, including curing compounds and other substances that contain soap, wax, oil, or silicone.

B. Vacuum clean concrete substrates to remove dirt, dust, debris, and loose particles.

C. For concrete substrates for tile floors installed with thin-set mortar, correct conditions that do not comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.

1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

3.03 TILE INSTALLATION, GENERAL

A. ANSI Tile Installation Standard: Comply with parts of ANSI 108 series of tile installation standards included under “American National Standard Specifications for the Installation of Ceramic Tile” that apply to type of setting and grouting materials and methods indicated.

B. TCNA Installation Guidelines: TCNA “Handbook for Ceramic, Glass and Stone Tile Installation”; comply with TCNA installation methods indicated.

C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions except as otherwise shown. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so that plates, collars, or covers overlap tile.

E. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area.

Adjust to minimize tile cutting. Provide uniform joint widths unless otherwise shown.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work.

F. Movement Joints: Follow TCNA "Handbook for Ceramic, Glass and Stone Tile Installation" Section EJ171 Movement Joint Guidelines for Ceramic, Glass and Stone. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated on the Drawings and approved shop drawings. If not shown or indicated provide movement joints as follows:

1. Space movement joints a maxium of 12-feet on center with a minimum joint width not less than 1/4-inch.

2. Install perimeter joints were tile abuts restraining surfaces such as perimeter walls, curbs, columns, and changes in plane and corners.

3. Sealing of expansion, control, and pressure-relieving joints is specified in Section 07920 – SEALANTS.

4. Keep expansion, control, and pressure-relieving joints free of plaster, mortar, grout, and other rigid materials.

G. Grout: Grouts shall comply with ANSI A108.10.

H. Allow tiles to set a minimum of 48 hours prior to grouting. The grout shall be forced into the joints to the full depth. Take special care not to scratch glazed tile during this operation. Remove surplus grout before it has hardened and leave the face of the tile clean. Keep expansion and control joints free of grout.

I. Sound tiles after setting to ensure proper bonding. Hollow sounding tiles shall be replaced.

J. Curing Floors: Apply reinforced kraft paper over floor as soon as pointing or grouting is completed. Lap the paper not less than 6 inches and leave in place for 3 full days. Cure in accordance with applicable ANSI installation procedure.

3.04 CONSTRUCTION TOLERANCES

A. Variation in Line: For positions shown in plan for edges of flooring and changes in color or finish, and continuous joint lines, do not exceed 1/8 inch in 96 inches, 1/4 inch in 20 feet, or 3/8 inch maximum.

B. Variation in Surface Plane of Paving and Flooring: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch maximum from level or slope indicated.

C. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/8 inch in 96 inches, 1/4 inch maximum.

D. Variation in Joint Width: Do not vary joint thickness more than 1/16 inch or one-forth of the nominal joint width, whichever is less.

3.05 FLOOR INSTALLATION METHODS

A. Install types of tile to comply with requirements indicated below for setting bed methods, TCNA installation methods related to types of subfloor construction, and grout types:

1. Latex Portland Cement Mortar (Interior): ANSI A108.5 (Mortar Bed) as indicated.

a. Above-Ground Concrete: TCNA Installation Method F122A for waterproofing and tile installation with ANSI A118.4 Latex-Porland cement mortar bond coat. Use LHT mortar for large format tiles.

2. Grout: Polymer Modified Tile grout.

B. Floor Installation

1. Apply thin-set or LHT mortar over waterproofing membrane over concrete using the appropriate type and size trowel recommended for the size tile by the tile manufacturer. Place only that amount of bonding mortar that can be covered with stone before initial set.

2. Back butter the tiles to ensure 100 percent contact and firmly press tile in the mortar. Move them forward and back, perpendicularly across the ridges, approximately 1/8-inch to 1/4-inch to flatten ridges, fill the valleys.

3. Tamp and beat tile with a wooden block or rubber mallet to obtain full contact with mortar and to bring finished surfaces within indicated tolerances. Set each unit in a single operation before initial set of mortar; do not return to areas already set and disturb tile for purposes of realigning finished surfaces or adjusting joints.

4. Rake out joints to depth required to receive grout as units are set.

C. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile unless otherwise indicated. Threshold installation shall comply with 2010 ADAAG Section 404.3.3. Clean as recommended by the manufacturer.

D. Joint Widths: Install tile on floors with the following joint widths:

1. Ceramic Tile: 3/16 inch.

3.06 WALL TILE INSTALLATION METHODS

A. Install types of tile designated for wall application to comply with requirements indicated below for setting-bed methods, TCNA installation methods related to subsurface wall conditions, and grout types:

1. Latex-Portland Cement Mortar: ANSI A108.5.

a. Tile Backer Board: TCNA Installation Method W245.

2. Grout: Polymer Modified Tile Grout.

3. Wall Installation:

a. Apply thin-set mortar over the gypsum tile backer board using the appropriate type and size trowel recommended for the size tile by the tile

manufacturer. Place only that amount of bonding mortar that can be covered with tile before initial set.

b. Press tile into freshly combed mortar, insuring mortar contact with tile while maintaining joint alignment and spacing. Keep adequate joint depth open for grounting.

c. Contact area shall not be less than 80% except in shower walls where contact area shall not be less than 95% when not less than three tile or tile assemblies are removed for inspection.

4. Joint Widths: Install tile on walls with the following joint widths:

a. Glazed Wall Tile: 1/16 inch.

B. Where toilet accessories straddle ceramic tile wainscot and wall surface above, hold tile back from the area where the accessory is to be mounted leaving the wall substrate exposed. Once accessory is mounted finish the tile up to the accessory's edges leaving a 1/4-inch joint between the tile and the accessory edge. Fill joint with sealant as specified in Section 07920 – SEALANTS.

3.07 WATERPROOFING INSTALLATION

A. Install waterproofing as specified in Section 09340 – TILE WATERPROOFING

3.08 GROUTING JOINTS

A. General:

1. Grout tile to comply with ANSI A108.10.

2. Remove temporary shims before grouting.

3. Tool joints uniformly and smoothly with plastic tool.

B. Flooring:

1. Grout joints as soon as possible after initial set of setting bed. Force grout into joints, taking care not to smear grout on adjoining stone and other surfaces. After initial set of grout, finish joints by tooling to produce a slightly concave polished joint, free of drying cracks.

2. Cure grout by maintaining in a damp condition for seven days except as otherwise recommended by latex-additive manufacturer.

3.09 JOINT-SEALANT INSTALLATION

A. Prepare joints and apply sealants of type and at locations indicated to comply with applicable requirements in Section 07920 – SEALANTS. Remove temporary shims before applying sealants

3.10 CLEANING AND PROTECTION

A. Cleaning: Upon completion of placement and grouting, clean all tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible. Clean in accordance with applicable ANSI installation procedure.

2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but no sooner than 14 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

C. Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer that ensure that tile is without damage or deterioration at time of Project Acceptance.

1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.
3. Protect tiled corners and external angles with board corner strips in areas used as passageways by workers.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION

August 16, 2021

SECTION 09340 – TILE WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes waterproofing for the following applications:

1. Interior Waterproofing Applications: Shower pans and walls and under tile at restroom floors.

2. The waterproofing shall not allow for the passage of water thru the waterproofing membrane.

3. Fully coordinate with mechanical systems. All MEP penetrations through waterproofing, such as mixing valves, shall be coordinated with waterproofing, sheathing and tile so that they can be flashed watertight and not rely solely on sealant at the face of the tile to provide for the primary waterproofing.

1.02 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Show extent of each type of waterproofing. Include details for treating substrate joints and cracks, flashings, deck penetrations, and other termination conditions. Any details included in the project documents are intended to be representational of the waterproofing systems at tile areas. The manufacturer and installer shall provide project specific details for each system and that represent all project conditions, including custom fabrications of premanufactured items if required.

C. Samples for Verification: For each type of waterproofing required, prepared on rigid backing and of same thickness and material indicated for the Work.

1. Provide stepped Samples on backing large enough to illustrate buildup of waterproofing.

D. Qualification Data: For Installer.

E. Material Test Reports: For each type of waterproofing.

F. Material Certificates: For each type of waterproofing, signed by manufacturers.

G. Field quality-control test reports.

H. Maintenance Data: For waterproofing (as applicable) to include in maintenance manuals. Identify substrates and types of waterproofing applied. Include recommendations for periodic inspections, cleaning, care, maintenance, and repair of waterproofing membranes.

I. Warranty: Special warranty specified in this Section.

J. All items per 1.03.

1.03 QUALITY ASSURANCE & PERFORMANCE REQUIREMENTS

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

must demonstrate not less than 5 years successful experience in installation of work similar to the work of this project. Credential and substantiating data must be submitted to the Architect.

B. Source Limitations:

1. Obtain all waterproofing types from a single manufacturer.

2. Obtain primary waterproofing materials, including primers, from a single manufacturer. Obtain secondary materials including sheet flashings, joint sealants, and substrate repair materials from primary material manufacturer or of type and from source recommended in writing by primary material manufacturer.

C. Regulatory Requirements: Provide products that comply with local regulations controlling use of volatile organic compounds (VOCs).

D. Materials shall comply with the following Standards:

1. ASTM - American Society for Testing and Materials

a. ASTM C 627 - Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester.

b. ASTM D 4068 - Standard Specification for Chlorinated Polyethylene (CPE) Sheeting for Concealed Water-Containment Membrane.

c. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.

2. ANSI – American National Standards Institute:

a. ANSI A108.13 – Installation of Load Bearing, Bonded, Waterproof Membranes for Thinset Ceramic Tile and Dimension Stone.

b. ANSI A118.10 – American National Standard Specification for Load Bearing, Bonded, Waterproof Membranes for Thinset Ceramic Tile and Dimension Stone Installation.

3. IAPMO – International Association of Plumbing and Mechanical Officials.

E. Membrane shall have maximum Moisture Vapor Permeance of 0.15 perms when tested in accordance with ASTM E 96 Procedure E.

F. Membrane must have UPC and IPC ratings as shower pan receptor waterproofing.

G. ANSI A108 Standards and TCNA recommendations shall be incorporated into work of this section.

H. Fully coordinate all work of this section with tile installation and all other adjacent materials.

I. Before submitting bids for work of this section, review all aspects and details of installation with the manufacturer to ensure that systems noted are the most appropriate and will function in concert with adjacent materials. Provide those materials and systems, if not noted, as recommended by the manufacturer to achieve a watertight condition at all installation areas.

J. Preinstallation Conference: Conduct conference at Project site.

1. Before installing waterproofing, meet with representatives of authorities having jurisdiction, manufacturer's technical representative, Architect,

consultants, independent testing agency, and other concerned entities. Review requirements for traffic coatings. Notify participants at least seven days before conference.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels showing the following information:

1. Manufacturer’s brand name.
2. Type of material
3. Directions of manufacture and shelf life.
4. Lot or batch number.
5. Mixing and application instructions.
6. Color.

B. Store materials in a clean, dry location protected from exposure to direct sunlight. In storage areas, maintain environmental conditions within range recommended in writing by manufacturer.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: Apply waterproofing materials within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply waterproofing to damp or wet substrates.

B. Do not install waterproofing until items that will penetrate membrane have been installed.

1.06 WARRANTY

A. Special Warranty for Interior Tile Waterproofing: Manufacturer's standard form in which manufacturer agrees to repair or replace waterproofing materials that deteriorate during the specified warranty period.

1. Deterioration of waterproofing includes the following:
   a. Rotting
   b. Cracking
   c. Microorganism Deterioration
2. Warranty Period: Life of the original installation.

PART 2 - PRODUCTS

2.01 INTERIOR TILE WATERPROOFING

A. Material Compatibility: Provide primers, sealants and miscellaneous materials that are compatible with one another and with substrate under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Under Tile Waterproofing for Interior Applications: ANSI A118.10; composite sheet membrane made from an alloy of non-plasticized chlorinated polyethylene (CPE) with non-woven fiber laminated to both sides, 0.030-inch nominal thickness.

C. Products: Subject to compliance with requirements, provide one of the following: Noble Company, Nobleseal TS (Basis of Design) or approved equal.

1. Pre-manufactured items for Interior Waterproofing: Whenever possible, utilize manufacturer's pre-manufactured items such as corners, curbs and other similar items.

D. Miscellaneous Materials

1. Bonding Mortar: Latex-Portland cement mortar, ANSI A118.4, with manufacturer's standard latex additive (water emulsion) serving as a replacement for part or all of gauging water.

E. Seam Sealants: Manufacturer's thermoplastic, high-solid, synthetic co-polymer rubber sealant; NobleSealant 150.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements and for other conditions affecting performance of waterproofing membranes.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.

2. Verify compatibility with and suitability of substrates.

3. Verify that substrates are visibly dry and free of moisture if recommended by manufacturer.

a. Test for moisture vapor transmission by plastic sheet method according to ASTM D 4263 if recommended by waterproofing manufacturer.

b. Test for moisture content by method recommended in writing by manufacturer.

4. Application of waterproofing indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. General: Before applying waterproof membranes, clean and prepare substrates according to manufacturer's written instructions to produce clean, dust-free, dry substrate for waterproof membrane application.

B. Mask adjoining surfaces not receiving waterproofing, deck drains, and other deck substrate penetrations to prevent spillage, leaking, and migration of waterproofing materials.

C. Substrates: Prepare surfaces to receive waterproofing per requirements and limitations of waterproofing materials and per manufacturer's recommendations.

3.03 INTERIOR TILE WATERPROOFING INSTALLATION

A. Waterproofing Application

1. Apply waterproofing systems per TCNA guidelines, ANSI requirements and per manufacturer's recommendations and in concert with tile systems to provide for a watertight condition at all areas where waterproofing is installed.

2. Spread bonding mortar with appropriate size trowel as recommended by the manufacturer to achieve full contact of membrane to substrate. Trowel an area as wide as the sheet and as far as can be comfortably reached. Trowel mortar in parallel rows across the wide or length of the sheet to avoid trapped air pockets under the membrane.

3. Unroll sheet into bonding mortar before mortar skins over and embed membrane using a rubber hand roller or flat side of trowel.

4. Prior to curing lift sheet and inspect for full contact.

5. Seaming: Where seams are required seam wall membrane together with 2-inch overlaps with the upper edge towards the direction of the drainage. Apply a 3/16-inch continuous bead of seam sealant, without skips or gaps, 3/4-inch from the edge of the sheet being overlapped. Overlap sheets and flattened seam with roller or flat side of trowel.

6. Turn sheet membrane installed on floors up vertical surfaces minimum 2-inches higher than finished floor and bond to substrate,

7. Drains: Install membrane manufacturer's drain flashing sheet in accordance to the manufacturer's written instructions. Locate drain and cut a hole in the waterproofing membrane to the size so as to overlap the drain flashing membrane 2-inches. Seam the waterproofing membrane to the drain flashing by applying a 3/16-inch continuous bead of seam sealant, without skips or gaps, 3/4-inch from the edge of the drain flashing. Flattened seam with roller or flat side of trowel.

B. Shower Walls Membrane Installation: Install sheet membrane over tile backer board up to the height of the shower head.

1. At interface of wall membrane to shower pan lap wall membrane over shower pan upturn by 2-inches shingle fashion in the direction of water drainage using the aforementioned seaming method.

2. If required seam wall membrane in the same fashion as the aforementioned seaming method.

C. Terminations, Corners and Penetrations:

1. Install manufacturer's pre-manufactured corners, end dams, and flashings at penetrations and hardware (custom fabricated if required). Use the aforementioned seaming procedure to weld on corners, end dams, and flashings.

3.04 FIELD QUALITY CONTROL

A. Final Waterproofing Inspection: Arrange for manufacturer's technical personnel to inspect membrane installation on completion.

1. Notify the Architect 48 hours in advance of date and time of inspection.

B. Water Testing:

1. Upon completion of sheet membrane waterproofing installation for each floor application perform water testing per guidelines established by ASTM D 5957 for a period of 24 hours.

a. Inspect waterproofing for leaks.

b. Repair leaks and re-test until watertight

2. Coordinate testing with general contractor and monitor at all times to prevent damage to the structure if there is failure. If failures occur, testing shall take place until such time that all areas pass water test. Testing shall be documented in writing and presented for acceptance of successful water testing.

3.05 PROTECTING AND CLEANING

A. Protect waterproofing from damage and wear during remainder of construction period.

B. Clean spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 09510 – SUSPENDED ACOUSTICAL CEILING PANELS SYSTEM

PART 1 - GENERAL

1.01 WORK INCLUDES

A. Acoustical Ceiling Systems
   1. Acoustical Ceiling Panels.
   2. Exposed grid suspension system.
   3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

1.02 REFERENCES

A. ASTM C 635 - Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

B. ASTM C 636 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

1.03 SYSTEM REQUIREMENTS

A. Structural Characteristics: Suspension system to rigidly secure acoustical ceiling system including integral mechanical and electrical components with maximum deflection of 1/360,
   1. Classification: ASTM C 635 Intermediate Duty Class.
   2. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, “Direct Hung” unless otherwise indicated. Comply with seismic design requirements.

B. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
   1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
      a. Flame Spread: 25 or less
      b. Smoke Developed: 50 or less

C. Acoustical Performance:
   1. Acoustical Panels:
      a. Noise Reduction Coefficient (NRC):
         i. ACT-1 & ACT-2: 0.70
      b. Ceiling Attenuation Class (CAC):
         i. ACT-1 & ACT-2: N/A

D. Seismic Requirements:

1. Acoustical ceiling system to be install in accordance with ASTM E 580 "Practice for Application of Acoustical Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Seismic Resistance".
    a. Seismic Zone: As determined by 2012 IBC and/or indicated on the Structural Drawings.

E. Optical Performance:

1. Acoustical Tile - Light Reflectance (LR) per ASTM E 1477: 0.90 or greater.

F. Source Limitations: Obtain each type of acoustical ceiling tile and supporting suspension system through one source from a single manufacturer.

1.04 SUBMITTALS

A. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.

B. Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.

C. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

E. Warranties: Special warranties specified in this Section.

1.05 QUALIFICATIONS

A. Grid Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum ten years documented experience.

B. Acoustical Unit Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum ten years documented experience.

1.06 COORDINATION

A. Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.07 PROJECT CONDITIONS

A. Space Enclosure: Do not install interior ceilings until space is enclosed and weatherproof; wet work in place is completed and nominally dry; work above ceilings is complete; and ambient conditions of temperature and humidity are continuously maintained at values near those intended for final occupancy. Building areas to receive ceilings shall be free of construction dust and debris.

1.08 EXTRA MATERIALS

A. Extra Materials: Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.

1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.

2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

1.09 WARRANTY

A. Acoustical Tiles: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical tiles that fail within the warranty period. Failures include, but are not limited to:

1. Acoustical Tiles: Sagging and warping.

2. Grid System: Rusting and manufacturer's defects

B. Warranty Period:

1. Acoustical Tiles: One (1) year from date of Substantial Completion.

2. Grid: Ten (10) years from date of Substantial Completion.

C. The Warranty shall not deprive the Owner of other rights they may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Asbestos Prohibition: No asbestos containing materials or equipment shall be used in this section. The Contractor shall ensure that all materials and equipment incorporated in the project are asbestos-free.

B. Products described in this Section are products of Armstrong World Industries, Inc. Products of one of the following manufacturers are acceptable subject to visual comparability and the requirements of this Section.

C. Suspension System:

1. Armstrong World Industries

2. USG Interiors, Inc.

3. or pre-approved equal.

D. Acoustical Tile Units:

1. Armstrong World Industries
2. USG Interiors, Inc.
3. Certainteed
4. or pre-approved equal

2.02 ACOUSTICAL CEILING TILE TYPES

A. Type **ACT-1**: Fiberglass tile with manufacturers factory-applied acoustically transparent membrane and CAC backing, protected to prevent sag when air conditioning is not in use and containing a bioblock to prevent mildew. ASTM E 1264, Type IV, Form 2, Pattern E.

1. Sizes: 2 foot by 2 foot by 3/4-inch thick.
2. Pattern: Ultima Health Zone, Square Lay-In as manufactured by Armstrong World Industries Inc.

2.03 SUSPENSION SYSTEMS

A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

B. Main beams and cross tees shall be hot dipped galvanized steel per ASTM A 653 and finished with baked on polyester paint, color to match the actual color of the selected ceiling tile.

1. Style: Prelude XL 15/16” Exposed Tee as manufactured by Armstrong World Industries, Inc.
2. Where indicated on the Drawings to fill in sections of existing suspension system, match the color of the existing grid members.

C. Edge Moldings and Trim: Of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner. Finish to match exposed tees.

D. Wire for Hangers and Ties: ASTM A 641, Class I zinc coating, soft temper, pre-stretched, with a yield stress load of at least three times the design load, but not less than 12 gauge. With clear non-ferrous hold down clips and factory-applied gaskets.

E. Seismic Struts: Manufacturer’s standard compression struts designed to accommodate lateral forces.

F. Seismic Clips: Manufacture’s standard seismic clips designed and placed to secure acoustical tiles in place.

2.04 ACCESSORIES

A. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify site conditions..

B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - LAY-IN GRID SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C 636 and as supplemented in this section. Install suspension system to comply with the seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook.".

B. Locate system on room axis according to reflected plan.

C. Install after major above ceiling and wet work is complete and humidity levels are stabilized in the building. Coordinate the location of hangers with other work.

D. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

E. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

H. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

I. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.

J. Do not eccentrically load system, or produce rotation of runners.

K. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet.

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

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay directional patterned units one way with pattern parallel to longest room axis. Fit border trim neatly against abutting surfaces.

D. Install units after above ceiling work is complete.

E. Install acoustical units level, in uniform plane, and free from twist, warp and dents.

F. Cut panels to fit irregular grid and perimeter edge trim. Field rabbet edge. Double cut and field paint exposed edges of tegular units.

G. Where round obstructions occur, provide preformed closers to match edge molding.

3.04 ERECTION TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

August 16, 2021

SECTION 09651 – LUXURY VINYL TILE FLOORING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Luxury Vinyl Tile (LVT)
2. Resilient Wall Base

1.02 SUBMITTALS

A. Product Data: Submit manufacturers data, installation instructions, and maintenance manuals for each type of resilient flooring and wall base.

B. Samples for Verification: Physical samples of each different color and pattern of flooring system and wall base specified, showing the full range of variations expected in these characteristics.

C. Product Certificates: Signed by manufacturers of resilient products certifying that each product furnished complies with requirements.

1.03 QUALITY ASSURANCE

A. Manufacturer: Provide flooring by a firm with a minimum of 10 years experience in the production of resilient flooring of the type equivalent to that specified.

B. Installer Qualifications: Engage an experienced installer with a minimum of 2 years experience to perform work of this Section who has specialized in installing resilient flooring products similar to those required for this Project and with a record of successful in-service performance.

C. Source Limitations: Obtain each type, color, and pattern of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

D. Fire-Test-Response Characteristics: Provide products with the following fire-test response characteristics as determined by testing identical products per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Critical Radiant Flux: 0.45 W/sq. cm or greater when tested per ASTM E 648.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store products in dry spaces protected from the weather, with ambient temperatures maintained between 50 and 90 deg F.

C. Store rolls upright.

D. Move products into spaces where they will be installed at least 48 hours before installation, unless longer conditioning period is recommended in writing by manufacturer.

1.05 PROJECT CONDITIONS

A. Maintain a temperature of 70 deg F plus or minus 5 deg F in spaces to receive products for at least 48 hours before installation, during installation, and for at least 48 hours after installation, unless manufacturer's written recommendations specify longer time periods. After post-installation period, maintain a temperature of not less than 55 deg F or more than 95 deg F.

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

C. Close spaces to traffic during flooring installation and for time period after installation recommended in writing by manufacturer.

D. Install flooring and accessories after other finishing operations, including painting, have been completed.

E. Do not install flooring over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive, as determined by flooring manufacturer's recommended bond and moisture test.

1.06 WARRANTY

A. Provide manufacturer’s warranty against defects in manufacturing and wear of resilient flooring for periods listed below:

1. Luxury Vinyl Tile: Ten (10) years from the Date of Substantial Completion.
2. Sheet Rubber Flooring: Ten (10) years from the Date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. General: Provide resilient flooring and wall base products that are FloorScore certified and low VOC emitting materials.

B. Solid Luxury Vinyl Tile Flooring (**LVT-02**): As Scheduled, ASTM F 1700

1. Resilient flooring tile composed of polyurethane heterogeneous plank
   a. Class: I
   b. Type: B (Embossed)
   c. Wear Layer Thickness: 20 mil (0.78-inch).
   d. Overall Thickness: 0.098-inch
   e. Size: As scheduled.
   f. Color and Pattern: As scheduled.

C. Resilient Wall Base: ASTM F 1861

1. Resilient base shall be thermoplastic, solid homogeneous rubber, Type TP (ASTM F-1861 Type TP, Group 1); manufactured by Tarkett North America, Burke-Mercer, Roppe or approved equal.
    a. Color and Size as indicated on the Drawings. Provide in manufacturer's standard coiled lengths.
    b. Provide coved toe base and pre-molded outside and inside corners.

2.02 INSTALLATION MATERIALS

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

B. Adhesives: Brush-on , roll-on, or trowel on water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
    1. For field applications that are inside the weatherproofing system, carpet tile adhesive product shall have the following VOC content limits:
        a. LVT Adhesives: 50 g/L.

C. Vapor Retarder (Where Required): Two-part, fluid- applied, epoxy based membrane compatible with flooring adhesive. For field applications that are inside the weatherproofing system, vapor retarder products shall have the a VOC content of not more than 100 g/L.
    1. Slab-Cote Extreme Moisture Vapor Barrier Coating as manufactured by Bostik, Inc.
    2. Drytek Moisture Vapor Barrier as manufactured by Laticrete
    3. Vapor Seal – HM as manufactured by Dependable Floor Products
    4. Or approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions where installation of vinyl products will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for sheet vinyl product installation and comply with requirements specified.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
    1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may act as a bond breaker. Substrate surface shall be smooth and flat to within 1/8 inch per 10 feet
    2. Slab shall be tested for moisture vapor emissions in accordance with ASTM F 1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Sub-floor Using Anhydrous Calcium Chloride or relative humidity in accordance with ASTM F 2170 Standard Test Method for Determining

Relative Humidity in Concrete Floor Slabs Using in situ Probes based of the flooring and adhesive manufacturer's recommendations or requirements.

a. ASTM F 1869 Testing: One test shall be conducted for every 1000 square feet of flooring and the results not to exceed the value required by the floor or adhesive manufacturer per 100 square feet per 24 hours whichever is more stringent.

b. ASTM F 2170 Testing: Preform three (3) tests for the first 1000 square feet and at least one additional test for each additional 1000 square feet of flooring and the results shall not to exceed the value required by the floor or adhesive manufacturer whichever is more stringent.

3. Perform alkalinity and adhesion tests recommended in writing by manufacturer.

4. Subfloor finishes comply with requirements of the flooring manufacturer for slabs receiving resilient flooring.

5. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. General: Comply with resilient product manufacturer's written installation instructions for preparing substrates indicated to receive resilient products.

B. If the vapor emission rate at the time of installation is found to exceed to required rate for floor covering installation, and it is determined and agreed upon by the Contractor and Architect that the vapor emission rate will not improve apply the specified vapor retarder in strict accordance to the manufacturer's written instructions.

C. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates. Substrate tolerance: level to within 1/8" in 10' at all locations.

D. Remove coatings, including curing compounds, and other substances that act as bond breakers and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

E. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

3.03 FLOOR INSTALLATION, GENERAL

A. General: Comply with tile manufacturer's written installation instructions..

B. Scribe, cut, and fit floor covering to butt neatly and tightly to vertical surfaces and permanent fixtures, including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.

C. Extend floor covering into toe spaces, door reveals, closets, and similar openings.

D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent, nonstaining marking device.

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

3.04 FLOOR TILE INSTALLATION

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

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

3.05 RESILIENT WALL BASE INSTALLATION

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

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

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

D. Do not stretch wall base during installation.

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

F. Premolded Corners: Install premolded corners before installing straight pieces.

3.06 CLEANING AND PROTECTING

A. Perform the following operations immediately after installing resilient products:

1. Remove adhesive and surface blemishes using cleaner recommended by resilient product manufacturers.

2. Sweep or vacuum floor thoroughly.

3. Do not wash floor until after time period recommended by flooring manufacturer.

B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by flooring manufacturer.

1. Cover products installed on floor surfaces with undyed, untreated building paper until inspection for Substantial Completion.

2. Do not move heavy and sharp objects directly over floor surfaces. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

C. Clean floor surfaces not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products according to manufacturer's written recommendations.

END OF SECTION

August 16, 2021

SECTION 09652 – SHEET VINYL FLOORING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Sheet Vinyl Flooring
2. Transition Strips

1.02 SUBMITTALS

A. Product Data: Submit manufacturers data, installation instructions, and maintenance manuals for resilient flooring

B. Samples for Verification: Physical samples of each different color and pattern of flooring system specified, showing the full range of variations expected in these characteristics.

C. Heat-Welded Seam Samples: For each flooring product and welding bead color and pattern combination required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to a rigid backing and prepared by Installer for this Project.

D. Product Certificates: Signed by manufacturers of resilient products certifying that each product furnished complies with requirements.

1.03 QUALITY ASSURANCE

A. Manufacturer: Provide flooring by a firm with a minimum of 10 years experience in the production of resilient flooring of the type equivalent to that specified.

B. Installer Qualifications: Engage an experienced installer with a minimum of 5 years experience to perform work of this Section who has specialized in installing resilient flooring products similar to those required for this Project and with a record of successful in-service performance.

C. Source Limitations: Obtain each type, color, and pattern of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

D. Slip Resistance: Flooring products shall have a Dynamic Coefficient of Friction (DCOF) AcuTest value shall not be less than 0.42 in accordance to ANSI A 137.1.

E. Fire-Test-Response Characteristics: Provide products with the following fire-test response characteristics as determined by testing identical products per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Critical Radiant Flux: 0.45 W/sq. cm or greater when tested per ASTM E 648.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store products in dry spaces protected from the weather, with ambient temperatures maintained between 55 and 85 deg F.

C. Store the indoor resilient surfacing rolls in an upright position on a smooth flat surface immediately upon delivery to Project.

D. Move products into spaces where they will be installed at least 48 hours before installation, unless longer conditioning period is recommended in writing by manufacturer.

1.05 PROJECT CONDITIONS

A. Maintain a temperature of 70 deg F plus or minus 5 deg F in spaces to receive products for at least 48 hours before installation, during installation, and for at least 48 hours after installation, unless manufacturer's written recommendations specify longer time periods. After post-installation period, maintain a temperature of not less than 55 deg F or more than 85 deg F.

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

C. Close spaces to traffic during flooring installation and for time period after installation recommended in writing by manufacturer.

D. Install flooring and accessories after other finishing operations, including painting, have been completed.

E. Do not install flooring over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive, as determined by flooring manufacturer's recommended bond and moisture test.

1.06 WARRANTY

A. Special Limited Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace flooring that fails within specified warranty period.

1. Material warranty must be direct from the product manufacturer.

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

a. Material manufacturing defects.

b. Surface wear and deterioration to the point of wear-through.

c. Failure due to substrate moisture exposure not exceeding the manufacturer’s required value for relative humidity when tested according to ASTM F2170 or for moisture vapor emission rate when tested according to ASTM F1869.

3. Warranty Period: Fifteen (15) years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

A. Sheet Vinyl Flooring with Integral Flash Cove Base **(RF-02 & RF-03)**:

1. Sheet Vinyl: ASTM F1303, Type 1, Grade 1, backed homogeneous sheet vinyl flooring with UV cured factory finish.
    a. Wear-Layer Thickness: 0.020-inch
    b. Overall Thickness: 0.098-inch
2. Seaming Method: Heat Welded.
3. Adhesive Method:
    a. Full-spread adhesive to completely adhere flooring to substrate.
    b. Complete adhesive coverage to eliminate the possibility of gaps or space between the slab and flooring material where moisture could accumulate and create an environment conducive to mold growth.
    c. Flooring to be adhered to the concrete slab in all locations eliminating the possibility of waves or wrinkles forming caused by the floor shifting, moving or by rolling loads displacing it.
4. Roll Size:
    a. Roll Width: Rolls to be a minimum width of 6-feet.
    b. Roll Length: Rolls to be a minimum length of 66-feet.
5. Color and Pattern: As schedule.
6. Performance Criteria:
    a. Static Load Limit/ Maximum Static Load:
        i. ASTM F 970: Exceed, -0.002-inch
        ii. Modified ASTM F 970 for maximum static load, 1500 PSI
    b. Residual Indentation: ASTM F1914; Exceeds, -0.005-inch
    c. Impact Resistance: ASTM F925; Excellent, results on request
    d. Impact Insulation Class: ASTM E989 (E492); 42
    e. Slab Moisture Design Tolerance:
        i. Maximum relative humidity of 90 percent when tested according to ASTM F 2170.
        ii. Maximum moisture vapor emission rate of 5 pounds of water per 1000 sq. ft. in 24 hours when tested according to ASTM F1869

        .

B. Accessories

1. Reducers: Butt-to transition, polyvinyl chloride (PVC), high quality additives, and colorants, ASTM E 648 Class 1.

2.02 INSTALLATION MATERIALS

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

B. Adhesives: Brush-on , roll-on, or trowel on water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Adhesive shall be solvent free with zero VOC content, low odor , no ammonia and non-flammable in wet state.

C. Heat Welding Bead: Solid-strand product of floor covering manufacturer. Color to match flooring.

1. Chemical-bonding compound shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Vapor Retarder (Where Required): Two-part, fluid- applied, epoxy based membrane compatible with flooring adhesive. For field applications that are inside the weatherproofing system, vapor retarder products shall have the a VOC content of not more than 100 g/L.

1. Slab-Cote Extreme Moisture Vapor Barrier Coating as manufactured by Bostik, Inc.
2. Drytek Moisture Vapor Barrier as manufactured by Laticrete
3. Vapor Seal – HM as manufactured by Dependable Floor Products
4. Or approved equal.

E. Integral Flash Cove Base Accessories:

1. Top Edge Cap Trim: Fabricated to act as edge cap for resilient sheet flooring. Round Cap No. 040, Mercer or pre-approved equal.
   a. Top Shape: Curved.
   b. Colors: As selected by Architect.
2. Cove Fillet Support Strip: Curved cove providing transition from floor to wall. Cove Stick No. 075 Semi-Rigid, Mercer or pre-approved equal.
   a. Curve Radius: 1 inch minimum.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions where installation of vinyl products will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for resilient product installation and comply with requirements specified.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may act as a bond breaker. Substrate surface shall be smooth and flat to within 1/8 inch per 10 feet

2. Slab shall be tested for moisture vapor emissions in accordance with ASTM F 1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Sub-floor Using Anhydrous Calcium Chloride or relative humidity in accordance with ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes based of the flooring and adhesive manufacturer's recommendations or requirements.
    a. ASTM F 1869 Testing: One test shall be conducted for every 1000 square feet of flooring and the results not to exceed the value required by the floor or adhesive manufacturer per 100 square feet per 24 hours whichever is more stringent.
    b. ASTM F 2170 Testing: Preform three (3) tests for the first 1000 square feet and at least one additional test for each additional 1000 square feet of flooring and the results shall not to exceed the value required by the floor or adhesive manufacturer whichever is more stringent.
3. Perform alkalinity and adhesion tests recommended in writing by manufacturer.
4. Subfloor finishes comply with requirements specified in Section 03300 - CAST-IN-PLACE CONCRETE for slabs receiving resilient flooring.
5. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. General: Comply with resilient product manufacturer's written installation instructions for preparing substrates indicated to receive resilient products.

B. Apply the specified vapor retarder or approved equal in strict accordance to the manufacturer's written instructions.

C. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates. Substrate tolerance: level to within 1/8" in 10' at all locations.

D. Remove coatings, including curing compounds, and other substances that act as bond breakers and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

E. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

3.03 FLOOR INSTALLATION, GENERAL

A. General: Comply with tile manufacturer's written installation instructions.

B. Scribe, cut, and fit floor covering to butt neatly and tightly to vertical surfaces and permanent fixtures, including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.

C. Extend floor covering into toe spaces, door reveals, closets, and similar openings.

D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent, nonstaining marking device.

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

3.04 SHEET VINYL INSTALLATION

A. Unroll sheet vinyl floor coverings and allow them to stabilize before cutting and fitting. Lay out sheet vinyl flooring maintaining uniformity of floor covering direction. Minimize the number of seams keeping seams a minimum 6-inches away from parallel joints in the floor covering. Match edges of flooring for color shading at seams. Avoid cross seams.

B. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.

C. Integral-Flash-Cove Base: Cove floor coverings 4 inches up vertical surfaces. Support floor coverings at horizontal and vertical junction by cove strip. Butt at top against cap strip.

3.05 CLEANING AND PROTECTING

A. Perform the following operations immediately after installing resilient products:

1. Remove adhesive and surface blemishes using cleaner recommended by resilient product manufacturers.
2. Sweep or vacuum floor thoroughly.
3. Do not wash floor until after time period recommended by flooring manufacturer.

B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by flooring manufacturer.

1. Cover products installed on floor surfaces with undyed, untreated building paper until inspection for Project Acceptance.
2. Do not move heavy and sharp objects directly over floor surfaces. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

C. Clean floor surfaces not more than 4 days before dates scheduled for inspections intended to establish the Project Acceptance date in each area of Project. Clean products according to manufacturer's written recommendations.

END OF SECTION

August 16, 2021

SECTION 09720 - WALL COVERINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:. Wall coverings and surface preparation.

B. Related Work Described Elsewhere:

1. Section 09250 – GYPSUM BOARD ASSEMBLIES for surface tolerances and finish level

2. Section 09900 – PAINTING for Wall Covering primer .

1.02 SUBMITTALS

A. Submit under the provisions of Section 01330 – SUBMITTAL PROCEDURES.

B. Material Safety Data Sheet (MSDS): Submit MSDS for adhesives.

C. Product Data: For each type of product indicated. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.

D. Shop Drawings: Show location and extent of each wall-covering type. Indicate seams and termination points.

E. Samples: Submit three samples, full width by 36-inches long, of each pattern and color. Mark top and face of material.

F. Schedule: For wall coverings. Use same designations indicated on Drawings.

G. Manufacturer's Installation and Maintenance Instructions: Indicate special procedures and perimeter conditions requiring special attention. Include maintenance data in maintenance manual for wall coverings.

1.03 QUALITY ASSURANCE

A. Installer: Use adequate numbers of skilled installers who are thoroughly trained and have at least 3 years experience installing wall covering similar to those specified herein. No allowance will be made for the lack of skill on part of the installers in the acceptance and or rejection of installed wall covering.

B. Manufacturer's Recommendations: The installation recommendations of the manufacturer of the wall covering used, when approved by the Architect shall be the basis for acceptance of rejection of actual installation methods used in this work.

C. Fire-Test-Response Characteristics: Provide wall coverings and adhesives with the following fire-test-response characteristics as determined by testing identical products applied with identical adhesives to substrates per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Growth Contribution: Textile wall coverings complying with acceptance criteria of Method B test protocol of NFPA 265 described in Chapter 8 of the 2006 IBC.

D. Field Samples: Provide field sample of wall covering on scheduled substrate, minimum width of 8-feet, full height, demonstrating wall covering appearance, joint seaming and edging techniques.

1. Accepted sample may remain as part of the completed Work.

1.04 DELIVERY AND STORAGE

A. General: Comply with instructions and recommendations of manufacturer and as herein specified.

B. Deliver materials to project site in original packages or containers clearly labeled to identify manufacturer, brand name, quality or grade, and fire hazard classification.

C. Store materials in original undamaged packages or containers with labels and seals intact. Store materials flat in clean, dry storage area. Do not store rolled goods in upright position.

1.05 JOB CONDITIONS

A. Install wall coverings only when normal temperature and humidity conditions approximate the same conditions that will exist when building is occupied. Maintain areas to receive wall coverings at a minimum temperature for 72 hours before , during and 48 hours after application of wall coverings.

B. Illuminate areas of installation using building's permanent lighting system; temporary lighting alone will not be acceptable. Provide a lighting level of 80-foot candles minimum, measured mid-height, on surfaces to receive wall coverings.

C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

1.06 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Wall-Covering Material: Full-size units equal to 5 percent of amount of each type installed.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Asbestos Prohibition: No asbestos containing materials or equipment shall be used in this section. The Contractor shall ensure that all materials and equipment incorporated in the project are asbestos-free.

B. General: Provide rolls of each type of wall covering from the same run number and dye lot.

C. Wall Covering (**WC-)**: Vinyl wall covering

1. Provide mildew-resistant, strippable, perforated (micro-vented) vinyl wall covering complying with FS CCC-W-408 for Type II, Medium Duty products, in 54-inch widths.
2. Backing: Polyester/ Cottom Osnaburg

D. Adhesive:

1. Vinyl Wall Covering Adhesive: Provide permeable, mildew-resistant, non-staining, water based adhesive, for use with specific wall covering and substrate application as recommended in writing by wall covering manufacturer.
   a. ECO-888 Clear Permeable Adhesive; Roman Decorating Products.
   b. Or approved equal.
2. Wood Veneer Wallcovering Adhesive: High solids, commercial grade clay-based adhesive.
   a. PRO-732 Extra-Strength Clay Wallcovering Adhesive; Roman Decorating Products.
   b. Or approved Equal.

E. Primer: Permeable, mildew-resistant primer as specified in Section 09900 – PAINTING.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine substrates and conditions under which wall covering is to be installed and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

B. Complete painting and all work that penetrate the substrate, before beginning wall covering installation. Test walls for moisture content with an electric moisture meter and take corrective measures if reading is more than 5 percent.

3.02 PREPARATION

A. Acclimatize wall covering materials by removing from packaging in area of installation not less than 24 hours before application.

B. Remove hardware, and hardware accessories, j-box plates, and surface-mounted fixtures in areas where wall covering is to be applied.

C. Fill cracks, crevices, and holes with compound recommended by the wall covering manufacturer. Sand rough spots smooth and remove residual powder using a damp cloth. Surfaces to be covered shall be thoroughly dry.

1. Moisture Content: Maximum of 5 percent on concrete when tested with an electronic moisture meter.

D. Prime and seal substrates with wall covering primer in accordance with wall covering manufacturer's recommendations for type of substrate.

3.03 INSTALLATION OF WALL COVERING

A. Apply adhesives and wall coverings in accordance with the manufacturer's printed instructions.

B. Place wall covering panels consecutively in order cut from rolls, including filling of spaces above or below openings. Hang by reversing alternate strips except on match patterns. After hanging the first three panels, obtain approval of color uniformity and pattern match.

C. Apply adhesive to back of wall covering and place in accordance with manufacturer's instructions. Install seams plumb, and at least 6-inches away from corners. Horizontal seams are not permitted. Overlap seams and double-cut to assure tight closure. Roll, brush, or use broad knife to remove air bubbles, wrinkles, blisters, and other defects. Cut wall covering evenly to edges of outlet boxes or support.

D. Trim salvages as required to assure color uniformity and pattern match.

E. Edges shall extend not less than 1/2-inch behind applied base and trim.

F. Seams and corners shall be securely pasted so that no moisture or water vapor can get behind the wall covering.

G. Wall coverings shall extend behind edges of switch and receptacle cover plates.

H. Remove excess adhesive along finished seams using warm water and clean sponge, and wipe dry and clean.

3.04 ADJUST AND CLEAN

A. Clean all surfaces in accordance with the manufacturer's recommendations and wipe the wall covering clean. There shall be no residual film or stain after cleaning.

B. Replace removed plates and fixtures; verify cut edges of wall coverings are completely concealed.

C. Remove surplus materials, rubbish, and debris resulting from wall covering installation upon completion of work, and leave areas of installation in neat, clean condition.

D. Replacement: In the event of damage, immediately make all repairs and replacement necessary to the approval of the Contracting Officer at no additional cost to the State.

END OF SECTION

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.01 SUMMARY

A. Work Includes: The work includes painting and finishing of exterior and interior items and surfaces throughout the project, whether scheduled or not, except as otherwise indicated. Painting shall include new work and surfaces made bare or damaged during construction. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of the work and are included in this Section.

B. The work includes field painting of exposed bare and covered pipes and conduits, and of hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under the mechanical or electrical work, such as ductwork, grilles, junction boxes, raceways and cabinets, except as otherwise indicated.

C. “Paint” as used herein means all coating systems materials, including primers, enamels, sealers, stain, varnish, and fillers, and other applied materials whether used as prime, intermediate or finish coats, except as specifically noted herein.

D. Paint all exposed surfaces whether or not colors are designated in “schedules.” Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas. If color or finish is not designated, the Architect will select these from standard colors available for the materials systems specified.

1.02 PAINTING NOT INCLUDED

A. The following categories of work are not included as part of the field-applied finish work or are included in other sections of these specifications.

1. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under the various sections for miscellaneous metal, hollow metal work, and similar items.

   Also, for fabricated components such as shop-fabricated or factory-built mechanical and electrical equipment or accessories.

2. Mechanical and Electrical Work: The prime coat for mechanical and electrical work is specified in Divisions 15 and 16, respectively. Finish coats are as specified herein.

3. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer finishing is specified for such items as (but not limited to) solid phenolic, plastic laminate, high performance organic coated metal, exterior finish system, finished mechanical and electrical equipment including light fixtures, switchgear and distribution cabinets.

4. Concealed Surfaces (Present and Future): Unless otherwise indicated painting is not required on surfaces such as walls or ceilings in conceal areas and generally inaccessible areas, furred areas, and pipe spaces.

5. Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium plate, and similar finished materials will not require finish painting, unless otherwise indicated.

6. Labels: Do not paint over any code-required labels, such as Underwriters' Laboratories, or any equipment identification, performance rating, name, or nomenclature plates.

1.03 SUBMITTALS

A. Submit under the provisions of Section 01330 – SUBMITTAL PROCEDURES.

B. Schedule of Finishes: Submit sets of the proposed painting finish schedule to the Architect for approval. The schedule shall indicate the wet film thickness (mils) which the proposed paints/coatings will be applied that are necessary to achieve the final dry film thickness indicated on the Schedule of Finishes under paragraph entitled “Schedule of Finishes”.

C. Color Samples: Submit the following to the Architect for approval.

1. Sets of each color finish sample.

D. Schedule of Operations: Before work on the project is commenced, complete sets of a work schedule showing Contractor’s sequence of operations and dates shall be submitted to the Architect.

E. Warranty: Copies of a written warranty shall be submitted to the Architect.

F. Certifications: Copies of asbestos-free, lead-free, zinc-chromate-free, strontium chromate-free, cadmium-free, and mercury free paint certificates shall be submitted to the Architect.

G. Manufacturer’s Product Data Sheets: Copies of the Manufacturer’s Product Data Sheets for the primers, paints, coatings, solvents, sealing and patching materials, sealants and caulking, and other materials being used shall be submitted to the Architect. Data sheets shall indicate thinning and mixing instructions, required film thickness (mil) and application instructions.

H. Manufacturer’s Material Safety Data Sheets: Copies of the Manufacturer’s Material Safety Data Sheets for coatings, solvents, and other hazardous materials shall be submitted to the Architect.

I. Comprehensive Spray Plan: Where the Contractor proposes to employ airless spraying, a Comprehensive Spray Plan including the following information shall be submitted to the Architect for approval:

1. Documentation that the individual spray applicator(s) on the project have completed an approved “Spray Applicator Certification Program”.

2. The overspray protection methods proposed.

3. The spray application instructions and recommendations of the paint manufacturer he proposes to use.

J. Certificate of Public Liability and Property Damage Insurance

1.04 ANALYZING AND TESTING

A. All paints and their applied thickness shall be subject to testing whenever the Architect deems necessary to determine conformation to the requirements of these specifications. Should testing by a laboratory be required, the laboratory shall be selected by the Architect and the cost of testing shall be borne by the Contractor. However, should test results show that the paint is in compliance with these specifications, the cost will be borne by HHSC.

B. All rejected material shall be removed from the job site immediately. Surfaces painted with the rejected material shall be redone at no additional cost to HHSC.

C. Where the required paint thickness is deficient, the affected surface(s) shall be recoated as necessary to provide the required paint thickness at no additional cost to HHSC.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

1.06 SPECIAL REQUIREMENTS

A. Codes: Comply with State OSHL (Occupational Safety and Health Law) and all pollution control regulations of the State Department of Health.

B. Safety methods used during coating application shall comply with SSPC-PA Guide 3.

C. Protection:

1. Persons:

a. Take all necessary precautions to protect public pedestrians including tenants from injury.

b. Provide, erect, and maintain safety barricades around scaffolds, hoists, and wherever Contractor's operation create hazardous conditions in order to properly protect the public and workmen.

2. Completed Work: Provide all necessary protection for wet paint surfaces.

3. Protective Covering: Provide and install protective covering over equipment, floor and other areas that are not scheduled for treatment. Protective covering shall be clean, sanitary drop cloth or plastic sheets. Paint applied to surfaces not scheduled for treatment shall be completely removed and surfaces shall be returned to original condition.

4. Safeguarding of Property: Take whatever steps necessary to safeguard the work and also the property of HHSC and other individuals in the vicinity of the work area during the execution of this Contract. Contractor shall be responsible for and make good on any and all damages and for losses to work or property caused by his or his employee's negligence. Where the damaged property cannot be cleaned and restored to its original condition

(i.e. prior to being damaged) it shall be replaced with a new product of equal quality. No proration or use of "used" products will be permitted.

a. The Contractor shall be assessed $300.00 for each incidence of property or personal damage caused by his or his employee's negligence until such time that a satisfactory settlement has been agreed upon by the damaged party and corrective action has been completed. All corrective action shall be settled within 24 hours from the time the damage is discovered. Should the Contractor fail to take corrective action in a timely and expeditious manner, the Architect will contact the Contractor's Insurance company to seek resolution on the matter.

b. The Architect will withhold payment due the Contractor until damages have been corrected or damage claims resolved. The amount of payment withheld shall be equal to a minimum of $2,000.00 plus the estimated cost of corrective action as determined by the Architect.

5. Fire Safety: Direct employees not to smoke in the vicinity and exercise precautions against fire at all times. Waste rags, plastic (polyester sheets), empty cans, etc., shall be removed from the site at the end of each day.

D. Right of Rejection: The Architect will have the right to reject all work which is not in compliance with the plans and specifications. Rejected work will be redone at no additional cost to HHSC.

In addition, the Architect will have the right to require the immediate removal of any paint applicator who demonstrates negligence, lack of competence or repeated non-compliance with the contract requirements.

E. Sequence of Operations: The sequence of operations shall divide the surfaces into work areas and present a schedule for:

1. Surface preparation and spot prime.
2. Prime coat.
3. First finish coat.
4. Second finish coat.

F. Inspection and Approvals: Obtain written approval from the Architect upon completion of each phase of work (phases of work are: surface preparation and spot prime; prime; first finish coat; second finish coat) before proceeding into the next phase of work. Give the Architect one day (24 hours minimum) advance notice of completion of any phase of work for a work area only when he deviates from the previously submitted work schedule. Provide necessary access to areas to be inspected.

Failure to obtain approval of any phase of work for a work area may result in redoing the operation at no cost to HHSC.

G. Sample Panels: Prior to commencing with the work, prepare a sample panel(s) of approximately 10 square feet indicative of the specified surface preparation and required number of paint coats to be applied for approval by the Architect. The intent of this requirement is to ensure adequate coverage/thickness and/or hiding value of the paint and proper hue. The location where the sample panel(s) is to be prepared will be selected by the Architect.

H. Ventilation of Interior Spaces Following Painting: Following the completion of interior painting and prior to final acceptance, the interior spaces shall be ventilated and allowed to "air-out" to remove paint odors such that no odors exist at HHSC's occupancy date. Where necessary and as deemed by the Architect, the Contractor shall provide fans to mechanically ventilate the space(s).

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver paint materials to the job site in original unopened containers with original labels intact.

B. No paint material, empty cans and paint brushes and rollers, drop cloths and rags, may be stored in buildings, but shall be stored in separate storage facilities away from the buildings. Receiving, opening, and mixing of painting materials shall be done in this area.

C. The Contractor may furnish a job site storage facility. Such facility shall comply with requirements of the local Fire Department. The storage area shall be kept clean and facility shall be locked when not in use or when no visual supervision is possible.

D. Ensure the safe storage and use of paint materials and the safe storage or disposal of waste, at the end of each work day.

1.08 WARRANTY

A. Warranty that the work performed under this section conforms to the contract requirements and is free of any defect in the materials used and workmanship performed by the Contractor. Such warranty shall continue for a period of two (2) years from the date of Substantial Completion and the Contractor shall remedy any such defect which is discovered during that period at no cost to HHSC.

B. HHSC will notify the Contractor in writing within a reasonable time after discovery of any failure or defect.

C. Should the Contractor fail to remedy any failure or defect described in Paragraph A above within 10 working days after receipt of notice thereof, HHSC shall have the right to repair or otherwise remedy such failure or defect and charge the Contractor for the cost of same.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Hazardous Material Prohibition: All paint shall be free of asbestos, lead, mercury, zinc-chromate and/or strontium chromate, and cadmium.

B. Asbestos Prohibition: No asbestos containing materials or equipment shall be used in this section. The Contractor shall ensure that all materials and equipment incorporated in the project are asbestos-free.

C. Material shall be equal in quality to that specified under the Schedule of Finishes and any given finish shall be as labeled by one manufacturer.

D. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants

added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Flat Paints, Coatings, and Primers: VOC content of 50 g/L.
2. Nonflat Paints, Coatings, and Primers: VOC content of 150 g/L.
3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
4. Zinc-Rich Industrial Maintenance Primers: VOC content of not more than 340 g/L.

E. All materials shall be delivered to the job site in undamaged original containers bearing the manufacturer's label and shall be stored in such a manner as to prevent damage. All rejected materials shall be removed from the job site immediately.

F. Subject to compliance with the requirements paints shall be as manufactured by one of the following manufacturers:

1. Benjamin Moore
2. Pittsburg Paints
3. Pratt & Lambert
4. Rust-Oleum
5. Sherwin-Williams
6. or Approved equal.

G. Thinning of paint shall be done using material recommended by the manufacturer. Mix proprietary products according to manufacturer's printed specifications. Compound thinner, mineral oil, kerosene, refined linseed oil, or gasoline shall not be used for thinning.

H. Mildew and Mold Resistance:

1. Mildew Treatment: All paints specified in this section shall be factory formulated to be mold and mildew resistant.
    a. The supplier shall submit aa signed certificate indicating that the primers and paints supplied for this Project are manufactured and factory formulated to be mold and mildew resistant
2. In the event a specified primer or finish paint is not formulated with mold and mildew resistant properties, provide each primer and finish paint with the maximum amount of mildewcide per gallon of paint permitted by the mildewcide manufacturer without adversely affecting the quality of the paint.
    a. Mildewcide Additive: Zinser Add2 Prevent Mildew Mildewcide Additive, or approved equal.
    b. The supplier shall submit a signed certificate indicating the amounts of mildewcide added by both the paint manufacturer and the paint supplier. Mercurial fungicide shall not be used.

2.02 SCHEDULE OF FINISHES

A. The Schedule of Finishes is made for the convenience of the Contractor and indicates the types and quality of finishes to be applied to the surfaces. Refer to Finish Schedule for symbols indicating location for various finishes. Provide additional systems for surfaces to be painted not listed hereinafter.

B. All paints unless otherwise noted, are the products of Benjamin Moore and are so named to establish desired quality and standard of materials. Painting materials, equal to those mentioned by trade name under the various treatments may be used, provided they meet with the approval of the Architect.

C. Treatments shall be applied on exposed surfaces of designated materials, in conformity with instructions of the paint product used.

D. Exterior Painting: Colors to be selected by Architect.

1. Concrete and Cement Plaster:

Primer Coat:	Benjamin Moore Ultra Spec Masonry Interior / Exterior 100% Acrylic Masonry Sealer (608)
2nd Coat: 3rd Coat	Benjamin Moore Ultra Spec Masonry Elastomeric Waterproofing Coating Low Lustre (0360)

2. Painted Wood:

Primer Coat:	Benjamin Moore Super Spec Exterior Latex Primer (169)
2nd Coat: 3rd Coat	Benjamin Moore Super Spec Latex House and Trim Paint (170)

E. Interior Painting: Colors to be selected by Architect.

1. Gypsum Board:

Wall:

Prime coat:	Benjamin Moore Ultra Spec 500 Interior Latex Primer N534
2nd and 3rd coats:	Benjamin Moore Ultra Spec SCUFF-X Interior Eggshell Finish 485

Ceiling:

Prime coat:	Benjamin Moore Ultra Spec 500 Interior Latex Primer N534
2nd and 3rd coats:	Benjamin Moore Ultra Spec SCUFF-X Interior Matte Finish 484

2. Painted Wood:

Prime coat:	Benjamin Moore Ultra Spec 500 Interior Latex Primer N534
2nd and 3rd coats:	Benjamin Moore Ultra Spec SCRUFF-X Interior Semi-Gloss Finish 487

3. Ferrous Metals:

Prime coat:	Ultra Spec® HP Acrylic Metal Primer (HP04)
2nd and 3rd coats:	Benjamin Moore Ultra Spec SCRUFF-X Interior Semi-Gloss Finish 487

4. Galvanized Metals:

Cleaner	Corotech Oil & Grease Emulsifier V600C
Prime coat:	Ultra Spec® HP Acrylic Metal Primer (HP04)
2nd and 3rd coats:	Benjamin Moore Ultra Spec SCRUFF-X Interior Semi-Gloss Finish 487

5. Wall Covering Primer:

1 coat:	Roman Decorating Products ECO-988 Pigmented, Permeable Primer.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

A. General:

1. Surface preparation shall be in accordance with the Painting and Decorating Contractors of America, “Architectural Specification Manual,” methods are applicable to all substrates.
2. Scrub surfaces with stiff nylon bristle brush and T.S.P. solution at rate of 3/4 cup T.S.P. per gallon of warm water to remove accumulated film of wax, oil, grease, smoke, dust, dirt, chalky, or other foreign matter which would impair bond or bleeding through new finish. Thoroughly sponge wipe surfaces with clean water. Allow surfaces to thoroughly dry before priming, painting, calking, or sealing.
   a. Following sponge wiping, the surfaces shall be allowed to dry for a minimum of 24 hours.
   b. Wood surfaces shall have a maximum moisture content of 12 percent when measured with an electronic moisture meter.

3. Cracks and openings found at joints and where different materials abut each other shall be sealed with a caulking compound compatible with the substrate and primer/paint. The caulking shall be applied and allowed to set in accordance with the manufacturer's recommendations and instructions.

B. The painting contractor shall be wholly responsible for the finish of his work and shall not commence any part of it until surfaces are in proper condition. If painting contractor considers any surfaces unsuitable for proper finish of his work, he shall notify the Architect of this fact in writing and he shall not apply any material until the unsuitable surfaces have been made satisfactory, or until the Architect has instructed him to proceed. Major defects shall be restored by the proper trades. In general, follow paint manufacturer's directions for surface preparation for the paint to be applied.

C. Remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for the complete painting of the items and adjacent surfaces. Following completion of painting of each space or area, reinstall the removed items by workmen skilled in the trades involved.

D. All necessary puttying of nail holes, cracks and blemishes shall be done after priming coat has become hard and dry and before second coat is applied.

E. All surfaces adjacent to areas being finished shall be protected and left clean of paints, stains, etc. Clean drop cloths shall be used until completion of job.

F. Unprimed galvanized metal shall be washed with a solution of chemical phosphoric metal etch and allowed to dry.

G. All metal surfaces shall be made clean and free of any defects or condition that may produce unsatisfactory finish. Touch-up any chipped or abraded places on surfaces that have been shop coated with the proper primer.

H. Gypsum Board Surfaces:

1. Surface Cleaning: Surfaces shall be dry. Remove loose dirt and dust by brushing with a soft brush or rubbing with a dry cloth prior to application of the first coat material.

2. Repair of Minor Defects: Prior to painting, repair joints, cracks, holes, surface irregularities, and other minor defects with patching plaster or spackling compound and sand smooth.

I. Plywood and Wood Surfaces:

1. Surface Cleaning: Surfaces shall be free from dust and other deleterious substances and in a condition approved by the Architect prior to receiving paint or other finish. Do not use water to clean uncoated wood.

2. Knots and Resinous Wood: Prior to application of paint, treat knots and resinous wood with an application of surface sealer.

3. Open Joints and Other Openings: Fill with whiting putty. Sand smooth after putty has dried.

4. Checking: Where checking of the wood is present, sand the surface, wipe, and apply a coat of pigmented orange shellac. Allow to dry before paint is applied.

J. PVC Trims and Accessories: Paint to match adjoining surfaces unless specifically indicated to remain unpainted.

3.02 PAINT APPLICATION

A. General:

1. Apply coating materials in accordance with SSPC-PA 1. SSPC-PA 1 methods are applicable to all substrates, except as modified herein. Thoroughly work coating materials into joints, crevices, and open spaces. Touch-up damaged coatings before applying subsequent coats.

2. All work shall be done in a workmanlike manner by skilled and experienced mechanics and shall conform to the best painting practices.

3. All materials shall be applied in accordance with the manufacturer's specifications and the finished surfaces shall be free from runs, sags, drips, ridges, waves, laps, streaks, brush marks and variations in color, texture and finish (glossy or dull). The coverage shall be complete and each coat shall be so applied as to produce a film of uniform thickness. No paint, varnish or enamel shall be applied until the preceding coat is thoroughly dry and approved.

4. Interior areas shall be broom clean and dust free before and during the application of coating material.

5. Any mixing shall be done outside the building.

B. Application:

1. Paint application shall be by brush, roller, airless spray painting or combination thereof or as required by manufacturer.

2. Where airless spraying is provided, a nozzle of the proper size in accordance with the paint manufacturer's recommendations to properly apply the paint shall be used.

3. Spray painting method shall be used only under approved conditions. Spraying shall be done only when there is no wind, or under very low wind velocity. When wind velocity increases, all spraying operation shall be stopped. Before start of spraying, all surfaces that do not require painting shall be completely masked and protected. Adequate drop cloths shall be provided over floors, adjacent sidewalks, and over all cars parked nearby that may be stained or damaged from the spray work.

4. Drying Time: Allow time between coats, as recommended by the coating manufacturer, to permit thorough drying. Provide each coat in specified condition to receive the next coat.

5. Primers and Intermediate Coats: Do not allow primers or intermediate coats to dry more than 30 days, or longer than recommended by the manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if primers or intermediate coats

are allowed to dry longer than recommended by manufacturers of subsequent coatings. Each coat shall cover the surface of the preceding coat or surface completely and there shall be a visually perceptible difference in shades of successive coats.

6. Finished Surfaces: Provide finished surfaces free from runs, drops, ridges, waves, laps, brush marks, and variations in selected colors.

C. Colors: Tint pigmented undercoats to approximately same shade as final coat. Perceptibly increase the shade of each successive coat. Colors shall be in accordance with the color schedule on the drawings or as selected by the Architect.

D. Finish Film Thickness: Apply primer, intermediate, and finish coats to not less than 1.5 mils dry film thickness, 4 mils wet unless recommended otherwise in writing by the manufacturer, for each coat and in accordance with the manufacturer's recommendations. Verify mil thickness by use of a suitable wet film gauge. Use a Tooke or other dry film gauge to test for total dry film thickness.

3.03 MECHANICAL AND ELECTRICAL WORK

A. Paint visible surfaces of ductwork or plenum spaces, and interior surfaces visible through grilles.

B. Paint shop primed metal surfaces of mechanical and electrical equipment with two finish coats of paint to match adjoining wall or ceiling surfaces. Prime unprimed bare metal surfaces with specified prime coat.

3.04 MISCELLANEOUS

A. Installation of Removed Items: After completion of final paint coat, Reinstall removed items.

B. At the completion of other trades, touch up damaged surfaces.

3.05 CLEAN UP

A. During the progress of the work, remove all debris, empty crates, waste, drippings, etc., and leave the grounds about the areas to be painted clean and orderly at the end of each work day.

B. Upon completion of the work, remove staging, scaffolding, containers and all other debris from the site. Remove all paint, shellac, oil or stains splashed or spilled upon adjacent surfaces not requiring treatment (hardware, fixture, floor) and leave the entire job clean and acceptable.

C. Rinsing and cleaning of painting equipment shall be done completely off campus. Use of campus facilities and fixtures is strictly prohibited.

END OF SECTION

SECTION 10100 - WHITEBOARDS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Porcelain enamel whiteboards.
2. Mechanically-fastened installations throughout.

B. Related Sections include the following:

1. Section 09900 - PAINTING for surface preparations prior to installations.
2. Divisions 15 and 16 for coordination of unit installations with adjacent mechanical and electrical work.

1.02 SUBMITTALS

A. Product Data: For each type of board indicated.

B. Shop Drawings: For each type of board required.

1. Include dimensioned elevations. Show location of joints between individual panels where unit dimensions exceed maximum panel length.
2. Include sections of typical trim members.
3. Show anchors, grounds, reinforcement, accessories, layout, and installation details.

C. Samples: For each type of visual display surface:

1. Visual display surface: 12-inch square mounted on substrate indicated for final work. Include one panel of each type, color and texture.
2. Trim: 6-inch long sections for each profile and finish.

1.03 QUALITY ASSURANCE

A. Source Limitations: Obtain boards through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of boards and are based on the products indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.04 PROJECT CONDITIONS

A. Field Measurements: Verify field measurements before preparation of Shop Drawings and before fabrication to ensure proper fitting. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

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

2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating boards without field measurements. Coordinate wall construction to ensure actual dimensions correspond to established dimensions.

1.05 WARRANTY

A. General Warranty: The special porcelain enamel warranty specified in this Article shall not deprive the State of other rights the State may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Porcelain Enamel Warranty: Submit a written warranty executed by manufacturer agreeing to replace porcelain enamel boards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking within the specified warranty period, provided the manufacturer's written instructions for handling, installation, protection, and maintenance have been followed.

1. Warranty Period: Life of the building.

PART 2 - PRODUCTS

2.01 MANUFACTURER/PRODUCTS

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

1. Clearidge Products and Equipment. (Basis-of-Design Product)

2. Marsh Industries.

3. Poly Vision Corp.

4. Or approved equal

2.02 MATERIALS

A. Porcelain Enamel Whiteboards: Balanced, high-pressure-laminated, porcelain enamel boards of 3-ply construction consisting of face sheet, core material, and backing.

1. Face Sheet: 0.024-inch enameling grade steel especially processed for temperatures used in coating porcelain on steel. Coat exposed face and edges with a 3-coat process consisting of primer, ground coat, and color cover coat. Coat concealed face with a 2-coat process consisting of primer and ground coat.

2. Core: Manufacturer's standard core, minimum 1/4-inch thick with manufacturers standard moisture barrier backing.

2.03 ACCESSORIES

A. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062inch-thick, extruded-aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units. Keep joints to a minimum. Miter corners to a neat, hairline closure.

1. Field-Applied Trim: Manufacturer's standard snap-on trim with no visible screws or exposed joints.

2. Chalktray: Manufacturer's standard, continuous, solid, extrusion-type, aluminum chalktray with ribbed section and smoothly curved exposed ends for each board.

2.04 FABRICATION

A. Assembly: Provide factory-assembled whiteboard units, unless field assembled units are required.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.

2. Provide manufacturer's standard vertical joint system between abutting sections of boards.

3. Provide manufacturer's standard mullion trim at joints between whiteboards and tackboards.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine wall surfaces, with Installer present, for compliance with requirements and other conditions affecting installation of boards.

1. Surfaces to receive whiteboards shall be free of dirt, scaling paint, and projections or depressions that would affect smooth, finished surfaces of whiteboards.

2. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Deliver factory-built boards completely assembled in one piece without joints, where possible. If dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.

B. Install wall-mounted units using manufacturer's approved or supplied fasteners, clips and related components, fastening mechanically at each location without using adhesives, at mounting heights indicated. Keep perimeter lines straight,

plumb, and level. Provide grounds, clips, backing materials, brackets, anchors, trim, and accessories necessary for complete installation.

C. Coordinate Project-site-assembled units with grounds, trim, and accessories. Join parts with a neat, precision fit.

3.03 ADJUSTING AND CLEANING

A. Verify that accessories required for each unit have been properly installed and that operating units function properly.

B. Clean units according to manufacturer's written instructions.

END OF SECTION

SECTION 10265 – IMPACT-RESISTANT WALL PROTECTION

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:

1. Impact-resistant wall coverings.
2. Corner Guards
3. Crash Rails

1.02 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.

C. Source Limitations: Obtain impact-resistant wall-protection units through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wallcovering and are based on the specific system indicated.

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

E. Fire-Test-Response Characteristics: Provide impact-resistant wallcovering with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.03 SUBMITTALS

A. Submit under provisions of Section 01330 – SUBMITTAL PROCEDURES.

B. Product Data: Include construction details, material descriptions, impact strength**,** fire-test-response characteristics, dimensions of individual components and profiles, and finishes for each type of impact-resistant wallcovering.

C. Shop Drawings: For each impact-resistant wallcovering showing locations and extent. Include sections, details, and attachments to other work.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below. Include Samples of accent strips to verify color selected**.**

1. Crash and Corner Guards: 12 inches long. Include examples of joinery, corners, end caps, top caps**,** and field splices.
2. Impact-Resistant Wall Covering: 6 by 6 inches square

E. Material Certificates: For each impact-resistant wallcovering, signed by manufacturer.

F. Maintenance Data: For each impact-resistant wallcovering to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

G. Warranty: Special warranty specified in this Section.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store impact-resistant wall-protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 50 deg F during the period plastic materials are stored.

2. Keep plastic sheet material out of direct sunlight.

3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.

a. Store impact resistant wall covering flat. Do not stand rolls or sheet on end.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install impact-resistant wallcovering until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F (21 deg C) for not less than 72 hours before beginning installation and for the remainder of the construction period.

B. Field Measurements: Verify actual locations of walls, columns, and other construction contiguous with impact-resistant wallcovering by field measurements before fabrication and indicate measurements on Shop Drawings.

1.06 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wallcovering that fail in materials or workmanship within specified warranty period.

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

a. Structural failures.

b. Deterioration of plastic and other materials beyond normal use.

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

1.07 EXTRA MATERIALS

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

1. Crash Rail and Corner-Guard Covers: Full-size plastic covers of maximum length equal to two of each type, color, and texture of units installed.

B. Include mounting and accessory components. Replacement materials shall be from same production run as installed units

PART 2 - PRODUCTS

2.01 IMPACT-RESISTANT WALL COVERINGS

A. Impact-Resistant Wall Covering (**WP-02**): Fabricated from plastic sheet wall-covering material having the following characteristics:

1. Impact Strength: Minimum 18 ft-lbf/in**.** of notch when tested according to ASTM D 256, Test Method A.
2. Impact Resistance: Minimum 6.5 in-lbs/mil when tested according to ASTM D 5420.
3. Fire Resistance Classification: Class A when tested in accordance with ASTM E 84:
   a. Flame-Spread Index: 25 or less.
   b. Smoke-Developed Index: 450 or less

B. Basis-of-Design Product: Subject to compliance with requirements, provide Koroguard Protective Wallcoverings or approved equal.

1. Size: 48 inches wide.
2. Sheet Thickness: 0.030-inch
3. Color and Texture: As Scheduled
4. Height: Wainscot as indicated on the Drawings.
5. Mounting: Adhesive.

C. Accessories

1. Adhesive: Adhesive shall be solvent free with zero VOC content, low odor, no ammonia and non-flammable in wet state.
   a. Hi-Stik Advantage adhesive.
2. Trims and Moldings: Manufacturer's standard for specified sheet gauge.

2.02 CORNER GUARDS

A. Basis-of-Design Product (**CG-01**): Subject to compliance with requirements, provide Korogard Wall Protection Systems; Division of RJF International Corporation; Koroseal "Korogard Series G400 Extruded Corner Guards" or approved equal.

B. Materials:

1. Extruded Rigid Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact-resistant acrylic-modified vinyl plastic with integral color throughout; extruded material, nominal 0.078-inch thick.
   a. Impact Resistance: Minimum 25.4 ft-lbf/in. of notch when tested according to ASTM D 256, Test Method A.
   b. Chemical and Stain Resistance: Tested according to ASTM D 543.
   c. Self-extinguishing when tested according to ASTM D 635.
   d. Flame-Spread Index: 25 or less.
   e. Smoke-Developed Index: 450 or less.
2. Adhesive: As recommended by impact-resistant plastic wall protection manufacturer.

2.03 CRASH RAILS

A. Crash Rail (**WP-03**): Heavy-duty assembly consisting of continuous snap-on plastic cover installed over concealed retainer system; designed to withstand impacts.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Korogard Wall Protection Systems; a division of RJF International Corporation; C400 Series or approved equal.
2. Cover: Extruded rigid plastic, minimum 0.078-inch wall thickness; as follows:
   a. Profile:
      1) C400: 4 inch high, 7/8 inch wide, surface-mounted flush on wall.
   b. Surface: Uniform with pebble texture finish
   c. Color: As scheduled.
3. Continuous Retainer: One-piece, extruded aluminum in the following thicknesses:
   a. C400: 0.062-inches
4. Retainer Clips: Manufacturer's standard impact-absorbing clips designed for heavy-duty performance.
5. End Caps and Corners: Prefabricated, injection-molded plastic; matching color cover; field adjustable for close alignment with snap-on cover.
6. Accessories: Concealed splices and mounting hardware.
7. Mounting: Surface mounted directly to wall

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of work.

1. Ensure the wall surface is free from dirt, grease, loose paint, and scale..
2. For impact-resistant wallcovering attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
    a. Measure moisture content of surfaces using an electronic moisture meter. Apply coatings only to surfaces with moisture content equal to or less than the following:
        1) Plaster and gypsum board: 4%
        2) Masonry, cement plaster, concrete and concrete block: 4%
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove rough spots by sanding smooth walls. On concrete substrates remove high spots using a mason's stone. Sand high-gloss surfaces to ensure proper adhesion.

B. Fill low spots on concrete wall with a trowelable Portland cement based patching compound approved by wall protection system manufacturer for applications indicated.

C. For surfaces receiving impact resistant wallcoverings apply an acrylic primer as specified in Section 09900 – PAINTING.

D. Complete finishing operations, including painting, before installing impact-resistant wall-protection system components.

E. Before installation, clean substrate to remove dust, debris, and loose particles.

3.03 INSTALLATION

A. General: Install impact-resistant wall-protection units level, plumb, and true to line without distortions in accordance with manufacturer's written instructions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work,

1. Install impact-resistant wall-protection units in locations and at mounting heights indicated on Drawings.
2. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.
    a. Provide anchoring devices to withstand imposed loads.

b. Where splices occur in horizontal runs of more than 20 feet (6.1 m), splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches (305 mm).

c. Adjust end caps as required to ensure tight seams

B. Install impact-resistance wallcovering to walls in accordance with the manufacturer's written instructions.

1. Install impact-resistant wallcovering in locations and at mounting heights indicated on Drawings.
2. Prior to installation, wallcovering, adhesive and accessories must be preconditioned for a minimum of 24 hours at the temperature between 65 F and 85 F.
3. Follow adhesive manufacturer's instruction for applying adhesive.
4. Install sheets with texture running in the same direction for uniform appearance.
5. Install top and edge moldings, corners, and divider bars as required for a complete installation.

3.04 CLEANING

A. Immediately after completion of installation, clean wallcovering and accessories using warm soapy water.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION

August 16, 2021

SECTION 10515 – PLASTIC LAMINATE LOCKERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Work Includes: Furnish all labor, materials, tools and equipment necessary to install all plastic laminate lockers and miscellaneous related work as called for or required by the drawings and as specified herein.

B. Related sections

1. Section 06100 - ROUGH CARPENTRY: Wood sleepers and blocking.
2. Section 09250 - GYPSUM BOARD ASSEMBLIES.

1.02 SUBMITTALS

A. Product Submittals: Follow Section 01330 – SUBMITTAL PROCEDURES.

1. Shop Drawings: Verify dimensions affecting locker installations. Show details of fabrication, method of installation, fillers, trim, base and accessories. Include locker numbering sequence information.
2. Product data.
3. Finish samples: Submit three 6-inch square finish samples of plastic laminate specified for lockers.
4. Manufacturer's installation instructions.

1.03 PERFORMANCE REQUIREMENTS

A. Flame Spread: When tested in accordance with ASTM E84-07, locker materials shall meet or exceed all requirements for Class B Flame Spread Rating and Smoke Developed and shall carry a Class B Fire Rating Certification in accordance with the requirements of NFPA and ICC. Class B Fire Rating Certification shall be in the name of the Locker Manufacturer and shall be less than six (6) months old.

1. Flame Spread: Not more than 75
2. Smoked Developed: Not more than 450.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with AWI (Architectural Woodwork Institute) Architectural Woodwork Quality Standards Illustrated or Woodwork Institute (WIC) Manual of Millwork.

1. Grade: Custom

B. Uniformity: Provide each type of locker produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.

C. Use only an installer approved by manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING

A. Do not deliver wood lockers until building is enclosed and ready for locker installation.

B. Store lockers in a dry well-ventilated area and protect all finishes from moisture, soiling and damage during handling.

1.06 PROJECT CONDITIONS

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

B. During and after installation, maintain same temperature and humidity conditions in building spaces as will occur after occupancy.

C. Protect locker finish and adjacent surfaces from damage.

1.07 ACCESSIBILITY

A. Accessible lockers shall conform by design or custom modification to the requirements of the 2010 ADA Standards for Accessible Design Sections 308 and 803.

1.08 WARRANTY

A. Locker manufacturer must warrant the new lockers for a period of 3 years from date of Substantial Completion for all defects in material and workmanship.

PART 2 - PRODUCTS

2.01 MANUFACTURER'S

A. Basis-of-Design Product: Hollman, Inc.; Nanolam Lockers or a comparable product of one of the following:

1. Ideal Products, Inc.
2. Salsbury Industries
3. or Approved Equal

B. Configuration: Lockers shall be double-tier in sizes and at locations as shown on the drawings. Contractor shall verify quantity, sizes, and location of lockers

2.02 MATERIALS

A. Shell: Fabricate from 5/8-inch fire retardant, 48 lb. industrial grade particle board core ANSI A208.1, Grade M-2 with 6 mil low pressure laminated vinyl or thermally fused melamine on both sides. Laminate colors to be selected from manufacturer's complete list of standard colors by Architect.

B. Exposed shell edges to be finished with self-edging 0.032-inch thick high-pressure plastic laminate or 1 mm polyvinyl chloride match locker plastic laminate.

C. Shelving: Fabricated from 3/4-inch fire retardant, 48 lb industrial grade particle board core; grade M-2 with thermally fused melamine finish.

D. Back Panel: 1/4-inch 48 lb. medium density fiberboard with 6 mil low pressure laminated vinyl, ventilated.

E. Doors to be fabricated from 3/4-inch fire retardant, 48 lb. industrial grade particle board core ANSI A208.1, Grade M-2 with high pressure plastic laminate, VGS-GP28, class II-B fire retardant.

1. Color: Architect to select from manufacturer's full range of standard colors.

F. End panels sloped top and filler panels to be fabricated from 3/4-inch fire retardant, 48 lb. industrial grade particle board core ANSI A208.1, Grade M-2 with high pressure plastic laminate, VGS-GP28, class II-B fire retardant.

1. Color: Architect to select from manufacturer's full range of standard colors.

G. Accessories

1. Lock Systems: Keyless digital locks; Digilock Standard Body ATS.

2. Fittings: Furnish each locker with the following:

a. Double-tier units: 1 double-prong ceiling mounted and shoe self.

3. Number plates: Manufacturer's standard etched, embossed or stamped, non-ferrous metal number plates with numerals not less than 1/4" high. Number lockers in sequence as directed by Architect. Attach plates to each locker door, near top, routed flush with surface.

4. Hinges: Manufacturer's standard fully concealed Euro hinges, 110-degree opening.

5. Pulls: Manufacturer's standard 4-inch wire pull.

2.03 FABRICATION

A. Fabricate lockers square, rigid, and without warp, with finished faces flat and free of scratches and chips, using manufacturer's standard method of fabrication.

B. Machine attachment holes accurately and free of chips. Attach fasteners standard with manufacturer.

C. Fabricate corners and fillers as required for installation.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine the surfaces and conditions under which work of this section will be performed. Do not proceed until unsatisfactory conditions detrimental to timely and proper completion of the work have been corrected.

3.02 PREPARATION

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, when possible, to ensure proper fitting. Allow for adjustment and fitting of trim and filler panels when field measurements before fabrication might delay work.

3.03 INSTALLATION

A. General: Install lockers accurately at locations shown in accordance with manufacturer's instructions for plumb, level, rigid, and flush installation.

B. Install manufactured supplied prefabricated base to floor at the locations indicated on the approved shop drawings taken care to ensure and stable and level base. Scribe exposed toe kicks to the floor for a clean, tight joint.

C. Anchor lockers to prefabricated bases as supplied by the manufacturer allowing for a 2-inch toe kick. Join lockers together with T-nuts and hex head screws through factory drilled holes.

D. Anchor lockers every 4 feet to furring or wall studs thru locker back using brass finished #8 fasteners and factory supplied straps.

E. Install end and corner filler panels and caps, cut to size in the field at locations indicated on approved shop drawings. Install end panels, finished tops and number plates.

3.04 ADJUST AND CLEAN

A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.

B. Touch-up marred finishes but replace units which cannot be restored to factory-finished appearance, before Project Acceptance. Use only materials and procedures recommended or furnished by locker manufacturer.

C. Upon completion of the work, clean lockers, remove surplus materials rubbish and debris resulting from the operations of this section.

END OF SECTION

August 16, 2021

SECTION 10520 - FIRE EXTINGUISHERS AND CABINETS

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes providing portable fire extinguishers to afford 100% complete fire protection throughout the indicated areas. The equipment, materials, installation, and workmanship shall be in strict accordance with the required and advisory provisions of NFPA 10 except as modified in this section.

B. The installation shall include all materials, accessories, and equipment necessary to provide each portable fire extinguisher ready for use. Install portable fire extinguishers to give full consideration to physical obstructions, furniture, and equipment.

C. In the National Fire Protection Association (NFPA) publications referred to herein, the advisory provisions shall be considered to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears; reference to the "authority having jurisdiction" shall be interpreted to mean the Building Department, and the Fire Department.

1. Reference to the “Building Department” on the Contract Drawings and herein shall be interpreted to mean the County of Kauai Department of Planning and Permitting.
2. Reference to the Fire Department on the Contract Drawings and herein shall be interpreted to mean the Kauai Fire Department.
3. Reference to the “State” on the Contract Drawings and herein shall be interpreted to mean the State of Hawaii.

1.02 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain extinguishers and cabinets from one source from a single manufacturer.

B. Coordination: Verify that cabinets are sized to accommodate type and capacity of extinguishers indicated.

C. Comply with all the requirements of the State of Hawaii, County of Kauai, and applicable utility companies.

D. Portable fire extinguishers shall be listed by the Underwriters Laboratories Inc. (UL), or approved by the FM Approvals (FM)

E. Comply with the recommendations and requirements of the latest editions of the Codes and Standards listed in this section in addition to detailed requirements of this specification. In the event of conflicting requirements, this specification shall prevail.

1. FM Global Publication:

   P7825 Approval Guide

2. International Code Council Publication:

   ICC/ANSI A117.7 American National Standard for Accessible and Usable Buildings and Facilities

3. National Fire Protection Association Publications:

   NFPA 10 Portable Fire Extinguishers

4. Underwriters Laboratories Inc Publications:

   UL FPED Fire Protection Equipment Directory
   UL FRD Fire Resistance Directory

1.03 SUBMITTALS

A. Submit in accordance with Section 01330 – SUBMITTAL PROCEDURES.

1. Manufacturer's Data: Submit manufacturer's descriptive literature and specifications. For fire extinguisher cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.

2. Certificates of Compliances: Fire extinguishers shall bear the UL label. In lieu of such label, a written certificate from a Nationally recognized testing agency adequately equipped and competent to perform such services may be submitted stating that the items have been tested and that the units conform to the requirements specified herein, including methods of testing of the specified agencies.

3. Samples: Submit samples of metal finishes for fire extinguisher cabinets.

1.04 DELIVERY AND STORAGE

A. Materials delivered to the site shall be inspected for damage, unloaded and stored with a minimum of handling. The storage spaces shall be dry locations with adequate ventilation, free from dust or water, and shall permit easy access for inspection and handling.

1.05 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.06 WARRANTY

A. Contractor and Installer shall warranty and certify in writing all work in this section for a period of two years from Substantial Completion date. Contractor shall be responsible for all damages to any part of premises during equipment installation work under this section.

B. The entire fire protection installation described hereinafter shall be guaranteed as a complete working unit for a period of two years. In the event of failure due to faulty workmanship or materials during this period, all said failures shall be corrected to the satisfaction of the State at no additional cost to the State for labor and material.

C. The above warranty shall not be interpreted as voiding, limiting, or reducing any equipment manufacturer's warranty or any guarantee permitted by law.

PART 2 - PRODUCTS

2.01 FIRE EXTINGUISHER

A. Manufacturers: Provide fire extinguishers as manufactured by Larsen's Manufacturing Co., Potter-Roemer, JL Industries, Inc. or approved equal.

B. Multi-Purpose Dry Chemical Fire Extinguishers: Provide UL rated 2A:10B:C, nominal 5 lb. capacity, ammonium phosphate extinguisher with red powder coated steel cylinder. Provide with completed inspection tags.

C. Provide with standard wall bracket where indicated for surface mounting.

2.02 FIRE EXTINGUISHER CABINETS

A. General: Provide fire extinguisher cabinets where indicated, of suitable size for housing fire extinguishers of types and capacities indicated.

B. Construction: Manufacturer's standard enameled steel box, with trim, frame, door and hardware to suit cabinet type, trim style, and door style indicated. Weld all joints and grind smooth. Miter and weld perimeter door frames.

C. Manufacturers: Provide fire extinguisher cabinets and brackets as manufactured by Larsen's Manufacturing Co., Potter-Roemer, JL Industries, Inc. or approved equal.

D. Cabinet Types: Suitable for mounting conditions indicated, of the following type:

1. Non- Rated Extinguisher Cabinets:
    a. Semi-recessed,
        i. 22 gauge steel box with aluminum frame and door .
        ii. Glazed Door: Duo- Vertical with tempered safety glazing.
        iii. Box Finish: White baked enamel.
        iv. Aluminum finish to be anodized, color to be selected by Contracting Officer.
    b. Surface Mounted,
        i. Aluminum box with aluminum frame and door .
        ii. Glazed Door: Duo- Vertical with tempered safety glazing.
        iii. Aluminum finish to be anodized, color to be selected by Contracting Officer

E. Brackets: For fire extinguishers not housed in a cabinet provide manufacturer’s standard surface mounted bracket and clamping strap, sized for specified fire extinguisher.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine rough-in cabinets to verify locations prior to cabinet installation.

B. Examine walls and partitions for thickness and framing for cabinets to verify cabinet depth and mounting prior to cabinet installation.

C. Do not proceed until satisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install the work of this section in strict accordance with the requirements of the State, Fire Department, Building Department, and applicable governmental agencies

B. Install fire extinguisher in each location noted on drawings for fire extinguisher (FE) and fire extinguisher cabinet (FEC).

C. Install units securely in place in accordance with manufacturer's recommended installation procedures.

D. Install in indicated locations and mounting heights unless otherwise required to comply with applicable regulations of governing authorities. Extinguishers and cabinets in walks, halls, corridors, passageways, or aisles shall not protrude more than 4-inches in conformance with the 2010 ADA Standards for Accessible Design Section 307.

E. Wipe all surfaces clean and free of soil, fingerprints, etc. after installation.

F. Bracket Mounted Fire Extinguishers: Mount 36 inches above finished floor measured to top of handle. Operating instructions shall face outward.

END OF SECTION

SECTION 10800 - TOILET ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Includes: The extent of each type of toilet accessory is shown on the drawings and herein specified.

B. Related Work Described Elsewhere:

1. Section 06100 - ROUGH CARPENTRY: Blocking.

1.02 QUALITY ASSURANCE

A. Inserts and Anchorages: Furnish inserts and anchoring devices for toilet accessories. Provide setting drawings, templates, instructions and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.

B. The structural strength of all grab bars, shower seats and all fasteners and mounting devices shall meet or exceed the accessibility requirements of the 2010 ADA Standards for Accessible Design Section 609.8

C. Products:

1. Provide products of the same manufacturer for each type of accessory unit and for units exposed in the same areas, wherever possible.

2. Coordinate with the Architect for acceptable designs and finishes.

3. Stamped names of labels on exposed faces of units will not be permitted, except where otherwise specified.

4. Provide locks where specified or standard with the manufacturer. One key shall fit all locks of one brand. Provide a minimum of 6 keys.

D. Accessibility: Mount accessories for accessible toilets in accordance with the 2010 ADA Standards for Accessible Design Sections 308.2.1, 609, 604.9.6, 603.3, 604.5, 604.9.5 where either in an accessible stall or accessible by all.

E. Drawings may be general in nature. Accessories shown for one stall or room shall be repeated in similar stalls or rooms unless noted otherwise.

1.03 SUBMITTALS

A. Submit in accordance with Section 01330 - SUBMITTALS.

1. Manufacturer's Data: For information only, submit copies of manufacturer's specifications and installation instructions for each toilet accessory.

2. Schedule: Submit a schedule listing types, quantities, and installation locations by room for each toilet accessory to be provided.

3. Samples: When requested, submit full-size samples of units to Architect for review of finishes. Acceptable samples will be returned and may be used in the work. Compliance with all other requirements is the exclusive responsibility of the Contractor.

1.04 DELIVERY, STORAGE AND HANDLING

A. Toilet accessories shall be wrapped for shipment and storage, delivered to the jobsite in manufacturer's original packaging and stored in a clean, dry area protected from construction damage and vandalism.

1.05 WARRANTY

A. Warranty: Submit a written warranty executed by mirror manufacturer, agreeing to replace any mirrors that develop visible silver spoilage defects within warranty period.

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

C. The warranty shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Stainless Steel: ASTM A 666 AISI, Type 304. Provide satin finish, in 0.0312-inch minimum nominal thickness, unless otherwise specified.

B. Galvanized Steel Sheet: ASTM A 653/A 653M, G60.

C. Fasteners: Screws, bolts and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

D. Galvanized Steel Mounting Devices: Hot-dip galvanized after fabrication ASTM A A 153/A 153M.

2.02 MANUFACTURERS

A. Product manufacturers as scheduled in the Drawings are basis-of-design manufacturers. Subject to compliance with the requirements manufacturers offering comparable products will be considered.

2.03 LIST OF TOILET ACCESSORIES

1. PTD-1, Paper Towel Dispenser - Bobrick B-35903
2. PTD-2, Paper Towel Dispenser – Bobrick B-4262
3. SD-1, Hand Soap Dispenser – Bobrick B-5050
4. P-Trap Cover - Plumberex Model 307 White ADA Compliant.
5. SND-1, Sanitary Napkin Disposal – Bobrick B-254
6. RH-1, Robe Hook – Bobrick B-76727
7. SCD-1, Seat Cover Dispenser – Bobrick B-4221
8. TTD-1, Toilet Tissue Dispenser – Bobrick B-4288

9. GB-1, GB-2, Grab Bars – Bobrick B-5806 Series
10. BCS-1, Baby Changing Station – Koala Kare Products, KB200-SS
11. MR-1, Electric Mirror – Electric Mirror EYL2-RC2.0-24.00X26.00-L7CSH-30K

PART 3 - EXECUTION

3.01 INSPECTION

A. Installer must examine the areas and conditions under which toilet accessories are to be installed. Notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

B. Determine that all blocking and concealed backer plates have been installed to allow mounting of accessories.

3.02 INSTALLATION

A. Use concealed fastenings wherever possible.

B. Provide anchors, bolts, backer plates, and other necessary fasteners, and attach accessories securely to walls and partitions in locations as shown or directed.

C. Install concealed mounting devices and fasteners fabricated of the same material as the accessories or of galvanized steel.

D. Install exposed mounting devices and fasteners finished to match the accessories.

E. Provide theft-resistant stainless steel fasteners for all accessory mountings.

F. Secure toilet room accessories to adjacent walls and partitions complying with the manufacturer's instructions for each item and each type of substrate construction.

G. Where accessories transition uneven substrates such as between ceramic tile wainscot and wall surface above, provide finish wood spacers to completely fill all voids. Finish to match wall surface or as directed.

H. Provide solid backing for all accessories.

3.03 CLEAN UP

A. Clean exposed surfaces as recommended by the manufacturer and restore damaged work to its original condition or replace with new.

END OF SECTION

SECTION 12497 – CUBICLE CURTAINS AND TRACKS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes curtain tracks and curtain fabric.

1.02 SUBMITTALS

A. Product Data: For the following:

1. Tracks: Include maximum weights of curtains that can be supported.

B. Shop Drawings:

1. Tracks: Show installation and anchorage details and locations of controls.

C. Coordination Drawings: For track installation; reflected ceiling plans drawn to scale and coordinating track installation with openings and ceiling-mounted items. Show the following:

1. Suspended ceiling components.

D. Samples for Initial Selection: For each type of product indicated.

E. Samples: As follows:

1. Tracks: 18 inches long, with carriers, controls, and accessories.

2. Curtain Fabric: For each color and pattern indicated, full width by 36 inches long, from dye lot to be used for the Work and with specified textile treatments applied. Show complete pattern repeat if any. Mark top and face of fabric.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: Installer shall be approved by manufacturer and shall have 5 years minimum experience of successful installations of specified products in projects of similar size and scope.

B. Fire-Test-Response Characteristics: For fabrics treated with fire retardants, provide products that pass NFPA 701 as determined by testing of fabrics that were treated using treatment-application method intended for use for this Project by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.04 EXTRA MATERIALS

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

1. Furnish two 2 full curtains and deliver to Owner.

PART 2 - PRODUCTS

2.01 CURTAIN TRACKS

A. Manually Operated Track:

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Construction Specialties; General Cubicle Track #6062N
    b. Covoc Corporation; 8770 Cubicle Track.
    c. Kircsh; #94003 Cubicle Track
    d. Silent Gliss USA; #6100 Cubicle Track
    e. or approved equal.
2. Construction: Extruded aluminum, 6063-T4 or 6063-T5, with corner bends fabricated from one piece.
    a. Lengths and Configurations: As indicated on Drawings
    b. Finish: Clear anodic coating.
3. Mounting Brackets: Aluminum, of type suitable for fastening track to surface indicated and designed to support weight of track assembly and drapery plus force applied to operate track.
    a. Mounting Surface: As indicated on Drawings.
4. Installation Fasteners: Sized to support track assembly and drapery, and fabricated from metal compatible with track, brackets, and supporting construction. Provide two fasteners to fasten each bracket to supporting construction.
5. Operation: Baton.
    a. Draw: One way, stack as indicated on Drawings.
6. Carriers: Rollers consisting of nylon axles and wheels with swivel eye and hooks.

2.02 CURTAINS

A. Curtain Fabric as scheduled on the Drawings (**WT-)**
    1. Orientation: Railroad (Stripes to run vertically).
    2. Width: 72-inches
    3. Pattern Repeat Distance: 39-1/2-inches vertically, 9-1/4-inches horizontally.
    4. Treatment: Inherently stain and flame resistant.

B. Heading: Manufacturer’s standard 20-inch white nylon mesh with 1/2-inch diameter holes. Space grommets at head 6-inches on center.

C. Curtain Tieback: At each termination.

2.03 CURTAIN FABRICATION

A. Fabricate curtains in heading styles and fullnesses indicated. Fabricate headings to stand erect. Overlap heading seams and double-lock stitch to body of curtain. If less than a full width of fabric is required to produce panel of specified fullness, use equal widths of not less than one-half width of fabric located at ends of panel.

1. One-Way-Stacking Curtains: Add 10% to the overall width but not less than 12-inches.

B. Seams: Sew vertical seams with twin-needle sewing machine with selvage trimmed and overlocked. Join widths so that patterns match and vertical seams lay flat and straight without puckering. Horizontal seams are not acceptable.

C. Bottom and Side Hems: Double-turned, 1-1/2-inch wide hems consisting of three layers of fabric, and blindstitched so that stitches are not visible on face of curtain.

PART 3 - EXECUTION

3.01 CURTAIN TRACK INSTALLATION

A. Install track systems according to manufacturer's written instructions, level and plumb, and at height and location in relation to adjoining openings as indicated on Drawings.

B. Isolate metal parts of tracks and brackets from concrete, masonry, and mortar to prevent galvanic action. Use tape or another method recommended in writing by track manufacturer.

3.02 CURTAIN INSTALLATION

A. Where curtains abut overhead construction, hang draperies so that clearance between headings and overhead construction is 1/4 inch.

B. Where draperies extend to floor, install so that bottom hems clear finished floor by not more than 15-inches and not less than 12-inches.

3.03 ADJUSTING

A. After hanging curtains, test and adjust each track to produce unencumbered, smooth operation.

B. Remove and replace curtains that are stained or soiled.

END OF SECTION

August 16, 2021

SECTION 13490 - RADIATION PROTECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Radiation protection products:

1. Lead sheet.
2. Lead-laminated gypsum board.
3. Radiation shielding leaded glass.
4. Lead-lined telescopic view window frames
5. Lead-lined radiation-shielded solid core wood doors.
6. Lead-lined hollow metal door frames.

B. Related Sections:

1. Section 06100 - ROUGH CARPENTRY.
2. Section 08115 – PREFINISHED STEEL DOOR FRAMES
3. Section 08210 – WOOD DOORS
4. Section 09250 – GYPSUM BOARD ASSEMBLIES.
5. Section 09900 - PAINTING.

1.02 DEFINITIONS

A. Lead Equivalence: Thickness of lead that provides same attenuation (reduction of radiation passing through) as material in question under specified conditions. Lead equivalence specified for materials used in diagnostic X-Ray rooms is measured at 150 kV unless indicated otherwise.

1.03 REFERENCES

A. American National Standards Institute – ANSI:

1. Fire Resistance Ratings – ANSI / UL 263.

B. American Society of Testing and Materials:

1. ASTM B749 – Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.
2. ASTM C 954: Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
3. ASTM C 1002: Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
4. ASTM C 1396 – Standard Specification for Gypsum Board.

5. ASTM - D 3273 – Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
6. ASTM E 119 – Fire Tests of Building Construction and Materials.

C. Federal Specification QQL-201 F Grade C.

D. Hollow Metal Manufacturers Association (HMMA) 840 – Installation and Storage of Hollow Metal Doors.

E. National Council on Radiation Protection and Measurements (NCRP):
1. NCRP Report No. 145 – Radiation Protection in Dentistry.
2. NCRP Report No. 147 – Structural Shielding for Medical X-Ray Imaging Facilities.
3. NCRP Report No. 151 – Structural Shielding Design and Evaluation for Megavoltage X- and Gamma Ray Radiotherapy Facilities.

F. Steel Door Institute (SDI)-100 – Recommended Specifications for Standard Steel Doors and Frames.

G. Wood Door Manufacturer's Association ANSI/WDMA I.S.-1A "Wood Flush Doors"

H. Physicist's Report: to be provided by Hawaii Health Systems Corporation

1.04 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Meetings: Conduct pre-installation meeting to coordinate radiation protection survey and verify project requirements and substrate conditions.

1.05 SUBMITTALS

A. Comply with the requirements of Section 01330 – SUBMITTAL PROCEDURES.

B. Product Data: Manufacturer's data sheets on each product to be used.

C. Shop Drawings:
1. Indicate layout of radiation-protected areas.
2. Indicate details, dimensions, finishes, and interface with adjoining work.
3. Indicate lead thickness or lead equivalencies of components.

D. Initial Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches square, represent actual product, color, and patterns.

F. Manufacturer's Certificates:
1. Certificate that leaded glazing capabilities meet or exceed specified requirements.

2. Certificate of compliance with applicable provisions of the National Council of Radiation Protection (NCRP).

G. Manufacturer's Instructions:

1. Preparation and installation instructions and recommendations.

2. Storage and handling requirements and recommendations.

H. Qualification Statements:

1. Manufacturer.

2. Installer.

I. Maintenance Data: Cleaning instructions for leaded glass.

J. Record Documentation: Record Drawings, with dimensions, showing locations of radiation protection.

K. Manufacturer's Certification: Upon completion of radiation protection work, Manufacturer and Installer shall furnish a certificate of compliance that all materials are in accordance with the specifications.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company with minimum of five (5) years successful experience specializing in manufacturing radiation protection products similar to those specified in the section.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five (5) years documented experience.

C. Radiation Protection Work: Comply with National Council of Radiation Protection (NCRP) Report No. 049 - Structural Shielding Design and Evaluation for Medical Use of X-Rays and Gamma Rays of Energies up to 10 MeV.

1. Comply with requirements of local regulatory agencies where local standards and criteria exceed requirements of NCRP Report Nos. #145, #147 and #151.

D. Single Source Responsibility: Obtain radiation protection materials and accessories produced or distributed as standard products from single manufacturer regularly engaged in production of X-Ray shielding materials, equipment, and accessories.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's instruction for receiving, handling, storing, and protecting materials.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Store materials in original packaging, protected from exposure to harmful environmental conditions, including static electricity, and at temperature and humidity conditions recommended by manufacturer.

D. Exercise care to prevent edge damaged materials.

1.08 FIELD CONDITIONS

A. Ambient Conditions: Maintain temperature, humidity, and ventilation condition within limits recommended by manufacturer for optimum results. Do not install products under ambient conditions outside manufacturer's absolute limits.

B. Lead-Laminated Gypsum Board:

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

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

3. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

a. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

b. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.09 COORDINATION

A. Coordinate the work of this Section with the respective trades responsible for installing interfacing work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Manufacturers: Subject to compliance with requirements, products by the following may be considered for the Work:

1. Construction Specialties, Inc., for lead lined solid-core wood doors.

2. Mayco Industries, Inc.

3. Nelco

2.02 RADIATION PROTECTION SYSTEM DESCRIPTION

A. Design Requirements:

1. Provide materials and workmanship, including joints and fasteners, that maintain continuity of radiation protection at all points and all directions equivalent to materials specified in thicknesses and locations indicated.

a. Thicknesses and configurations of lead-lined materials shall be determined from Physicist Reports to be provided by Hawaii Health Systems Corporation.

2. Lead-Lined Assemblies: Provide lead thickness in gypsum board, plywood, doors, door frames, window frames, and other items located in

lead-lined assemblies, not less than that indicated for assemblies in which they are installed unless indicated otherwise.

3. Lead Glazing: Provide lead equivalence not less than that indicated for assembly in which glazing is installed unless indicated otherwise.

2.03 LEAD SHEET

A. Lead Sheet: 99.9 percent or better pure unpierced virgin lead, free from dross, oxide inclusions, scale, laminations, blisters, and cracks.

1. Sheet Lead shall meet or exceed the Federal Specification QQL-201 F Grade C and ASTM B749-03 Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products, see NCRP reports #145, #147 and #151.

2. Thickness: As determined by Physicist Reports to be provided by Hawaii Health Systems Corporation, but not less than 1/16 inch if not indicated.

3. Variation in Sheet Thickness: Not to exceed five (5) percent.

2.04 LEAD-LAMINATED GYPSUM BOARD, GENERAL

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by UL (Underwriter's Laboratories Inc.) or other independent testing agency.

1. Lead-laminated gypsum panels shall be identified with the UL label affixed to the lead side indicating shielding material manufacturer and current fire-resistance listing and UL classification per the current UL Certifications Directory and as tested in accordance with the standard fire tests of building construction and materials per ANSI/UL 263.

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

2.05 LEAD-LAMINATED GYPSUM BOARD

A. Lead-Laminated Gypsum Board: Single unpierced layer of sheet lead laminated to back of gypsum board.

1. Gypsum Board With Enhanced Mold And Mildew: Type X, ASTM C 1396.

a. Core: Mold and moisture resistant, fire-resistance rated gypsum core

b. Surface paper: 100% recycled content moisture/mold/mildew resistant paper on front, back and long edges.

c. Long Edges: Tapered

d. Thickness: 5/8-inch

e. Mold/Mildew Resistance: 10 when tested in accordance with ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

2.06 RADIATION SHIELDING LEADED GLASS

A. Radiation Shielding Leaded Glass: Clear leaded glass containing 48 percent lead oxide (by weight) and 15 percent barium. Thickness as required to provide radiation protection equivalent to that provided by sheet lead in partition in which lead glass is installed.

1. Thickness: Thickness required yielding an equivalency as indicated in Physicists Reports.

2.07 LEAD-LINED TELESCOPIC VIEW WINDOW FRAMES

A. Lead-Lined Telescopic View Window Frames: Construct of 16 gage welded steel frames adjustable from 4 inches to 6¼ inches wall thickness. Frames shall be capable of accepting any thickness of radiation shielding leaded glass, radiation shielding X-Ray safety glass, or radiation shielding leaded acrylic. Frame corners shall be fully welded and ground smooth.

1. Provide radiation protection equivalent to that provided by sheet lead in partition in which view window is installed.
2. Provide 1/2-inch removable, reversible stops. Predrill and countersink to allow for glass thickness indicated above.
3. Provide frames with voice transmission slots.

2.08 LEAD-LINED SOLID CORE WOOD DOORS

A. Flush construction using two layers of sheet lead in balanced construction, laminated between core and crossband on each side.

1. Extend sheet lead lining to door edges providing X-Ray absorption equal to partition in which door occurs.
2. Shield cutouts for lock sets with sheet lead lapping, lead lining of lock sets or door lining, of equal thickness lead as used in door of same opening.
3. Crossband: High-Density Fiberboard.
4. Blocking:
   a. Top Rail: 5-inches
   b. Bottom Rail: 1-inch
   c. Fixed Non-replaceable Stiles: 1-inch structural composite lumber.
      1) Extend stiles full height of door and bevel 1/8 inch for each 2 inches of door thickness.
5. Door Face and Vertical Stile Cladding: Match door facing specified in Section 08210 – WOOD DOORS.

2.09 LEAD-LINED HOLLOW METAL DOOR FRAMES

A. Lead-Lined Hollow Metal Door Frames:

1. Construction: Line inside of frames with single unpierced strip of sheet lead of not less than same thickness as lead in doors and walls in which installed.

   a. Form lead sheet to match contour of frame on radiation exposure side of frame, continuous in each jamb and across head and over lap into formed stop.

   b. Form lead shields around areas prepared to receive hardware.

   c. Fabricate lead lining wide enough to maintain an effective 1/2" minimum overlap lap with lead of adjoining shielding.

   d. Design lead-lined door frames to accommodate lead lining up to 1/2 inch thick.

2. Door Frame Supports: 2-1/4 inches steel angle iron.

3. Jamb Depth: Appropriate depth for partition type referenced.

4. Jamb Profile: 2”

5. Head Profile: 2-inches

6. Frame Thickness: 16 gauge.

2.10 FINISHES

A. Field Painted Surfaces: As specified in Section 09900- PAINTING

1. Colors: As selected.

B. Prefinished Surfaces: Colors as selected.

2.11 ACCESSORIES

A. Lead Discs: 5/16 inch diameter lead discs for use with screw heads.

B. Lead Strips: 2 inches wide, unless indicated otherwise, by same thickness as sheet lead laminated on gypsum board.

C. Lead Angles: Leak-proof, lead angle system providing complete coverage of gamma rays used in lieu of lead strips and lead discs where sheet lead thickness is greater than 1/8 inch thick.

D. Gypsum Board Fasteners:

1. Screw Fasteners for Metal Framing - Self Tapping: Type S, bugle head self-piercing tapping screws complying with ASTM C 1002, length as required, for applying lead-laminated gypsum board to light gage metal framing having thickness of 0.033 to 0.112 inch thick.

E. Adhesive: Acceptable to radiation protection product manufacturer and capable of adhering lead sheets where required.

F. Tie Wire: Leaded steel, annealed.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that existing framing, surfaces and substrates are ready to receive work and opening dimensions are as indicated on Shop Drawings or as instructed by the manufacturer.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION OF LEAD-LAMINATED GYPSUM BOARD

A. Comply with manufacturer's recommendations.

B. Lead Strips: Adhere lead strips on face of studs at joints in lead-laminated gypsum board, including inside and outside corners. Use 2 inches wide strips by same thickness as sheet lead laminated on gypsum board.

1. Lead strips are not required on 49” or greater lead sheet widths.

C. Shim studs and other framing members as necessary to provide flat, flush finished surfaces.

D. Install lead angles per manufacturer's recommendations.

E. Install lead-laminated gypsum board on framing with screws spaced not more than 8 inches on center along edges of board and 12 inches on center in field of board.

F. Adhere lead discs to fastener heads. In each case, use method that provides continuous radiation shielding.

G. Where lead-laminated gypsum board is final substrate, apply joint treatment on fasteners and joints per Section 09250 – GYPSUM BOARD ASSEMBLIES.

H. Where second layer of gypsum board occurs over lead-laminated gypsum board, comply with Section 09250 – GYPSUM BOARD ASSEMBLIES for application of second layer.

3.03 INSTALLATION OF DOORS AND FRAMES

A. Lead-Lined Frames: Install lead-lined steel door frames in accordance with Section 08115 – PREFINISHED STEEL DOOR FRAMES. Comply with NAAMM HMMA 840 unless otherwise indicated. Set frames accurately in position, plumb, and braced securely until permanent anchors are set.

1. Secure door frames with steel stud anchors if lead lining is below 1/8 inch thick.

2. Door Frame Supports (utilize if lead thickness is 1/8 inch or greater):

a. Run steel angle supports full height on each door frame jamb and fasten to structure above.

b. Spot-weld supports at 6 inches along jambs and at corners of jambs and head frame.

c. Anchor frame to substrate with fasteners appropriate for substrate.

d. Apply coat of asphalt mastic or paint to lead lining in door frames where lead will come in contact with masonry or grout.

3. Provide 3 anchors per jamb, located adjacent to hinge on hinge jamb, and at corresponding heights on strike jamb.

4. In metal stud construction, use wall anchors attached to studs with screws.

5. Lap lead lining of frames over lining in walls at least 1 inch.

6. Lead Lining of Frames: Line inside of frames with lead of thickness not less than that required in doors and walls in which frames are used. Form lead to match frame contour, continuous in each jamb and across head, lapping stops. Form lead shields around areas prepared to receive hardware. Lap lining over lining in walls at least 1 inch.

B. Lead-Lined Wood Doors:

1. Install lead-lined wood doors in accordance with Section 08210 – WOOD DOORS unless otherwise indicated

2. Install doors in frames level and plumb, aligned with frames and with uniform clearance at edges.

C. Hardware: Line covers, escutcheons, and plates to provide effective shielding at cutouts and penetrations of frames and doors. Refer to Door Schedule for hardware used.

D. Touch up damaged finishes with compatible coating after sanding smooth.

3.04 INSTALLATION OF WINDOW FRAMES

A. Set unleaded side of frame plumb and square in wall opening on control room side of wall with shims.

B. Set leaded side of frame plumb and square in wall opening on radiation side of wall.

C. Compress sides together against faces of wall.

D. Install setting blocks, shims, and glazing tape in glazing channel to prevent galls from touching steel frame.

E. Install radiation resistant glazing in telescopic frame.

F. Place steel stops in position and mark location of stop and frame retaining holes on steel frame.

G. Remove glazing and drill holes in steel frame.

H. Place glazing and stops and hand drive setting screws.

3.05 INSTALLATION OF PENETRATING ITEMS

A. At penetrations of lead linings; provide lead shields to maintain continuity of protection.

B. Provide lead linings, sleeves, shields, and other protection in thickness not less than that required in assembly being penetrated.

C. Cut wall penetration covers from lead sheet of equal or greater thickness than backing on adjacent wall panels. Cut wall penetration covers to size required to cover wall penetrations with laps 1 inch minimum wide as indicated on penetration detail drawings.

D. Adhesive-apply lead sheet penetration covers on penetrating boxes and raceways and return penetration covers to backside of lead-backed wall panels with 1 inch minimum laps.

1. Do not use penetrating fasteners unless indicated otherwise.

E. Outlet Boxes and Conduit: Install between studs using steel telescoping mounting brackets. Cover or line with lead sheet lapped over adjacent lead lining at least 1 inch. Wrap conduit with lead sheet for 10 inches in from box.

3.06 INSTALLATION OF WALL PENETRATION COVERS

A. Duct Penetrations With 8 PSF or Less Lead Sheet:

1. Wrap ducts with wall penetration covers, lapping lead joints 1 inch minimum.

2. Secure lead sheet in place with 1 inch minimum width steel bands spaced not more than 12 inches on center.

3. Do not cut into lead sheet with tightening steel bands.

B. Duct Penetrations with Greater than 8 psf Lead Sheet and Where Duct Shielding Exceeds 24 Inches in Width:

1. Laminate wall penetration covers to plywood or other similar structural panels conforming to shape of duct, lapping lead joints 1 inch minimum.

2. Secure lead laminated panels to ducts with mechanical fasteners located at duct seams and corners.

3. Where necessary to prevent lead laminated panels from overloading duct supports, independently suspend panels from hangers secured to overhead building structure.

4. Cover fastener heads with lead sheet matching thickness of adjacent lead.

C. Piping: Unless indicated otherwise, wrap piping with lead sheet for 10 inches from point of penetration.

3.07 ACCESSORY INSTALLATION

A. Comply with manufacturer's recommendations.

B. Wherever lead protection is penetrated, cut, or punctured, assure continuity of shielding by use of sheet lead, lead plugs or other approved method.

C. Install sheet lead lining within steel door frames to provide radiation protection to levels indicated or levels required to match adjacent wall protection.

D. Wrap electrical outlet boxes, view window frames, and other penetrations through lead barrier material with sheet lead to provide radiation protection to levels indicated or levels required to match adjacent wall protection.

3.08 FIELD QUALITY CONTROL

A. Radiation Protection Survey: Employ a registered X-Ray physicist, certified by American Board of Radiology, for testing specified radiation protective Work and to conduct radiation protection survey of facility after radiation shielding materials are installed.

1. Take radiation measurements and indicate evaluation of measurements in report. Submit report to Architect and Owner upon completion of report.

2. Take radiation measurements in locations indicated by Architect.

B. Correct deficiencies in, or remove and replace, radiation protection Work that testing indicates does not comply with specified requirements.

3.09 ADJUSTING

A. Check and readjust operating hardware items, leaving doors and frames undamaged and in proper operating condition.

3.10 CLEANING

A. Remove excess materials from site and leave Work areas broom clean.

B. Leave exposed surfaces ready for site finishing.

3.11 PROTECTION

A. Lock radiation-protected rooms once door hardware is installed. Limit access to only those persons performing Work in radiation-protected rooms or as directed by Owner.

B. Tape temporary paper signs on radiation-resistant walls with the following text:

1. “Do not mount equipment on this wall without covering penetrating fasteners with lead sheet of thickness required by Contract Documents."

END OF SECTION

SECTION 15010 - MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. The General Conditions, Supplementary General Conditions, Special Conditions, Instructions to Bidders and all other Contract Documents shall apply to these sections. This section shall apply jointly and severally to each and every heating, ventilating and air conditioning subcontract section as they may be known.

1.02 DEFINITIONS

A. “Piping” includes, in addition to pipe, all fittings, valves, hangers, and other accessories related to such piping.

B. “Concealed” means hidden from sight as in chases, furred spaces, shafts, hung ceilings, crawl spaces, attics or embedded in construction.

C. “Exposed” means “not concealed” as defined above. Work in trenches, crawl spaces, and tunnels shall be considered “exposed” unless otherwise specifically noted.

D. Where any device or part of equipment is herein referred to in the singular number (such as “the pump”), such reference shall be deemed to apply to as many such devices as are required to complete the installation and as shown on the Drawings.

E. “HVAC” refers to the Heating, Ventilating and Air Conditioning Contract.

1.03 WORK INCLUDED

A. The Contractor shall furnish all permits (federal, state, county and local government), labor, equipment, supplies and materials, as well as perform all operations required to complete HVAC work indicated on the drawings and/or specifications herein, including, but not limited to the following:

1. Heating, Ventilating and Air Conditioning Systems, including:

    a. Duct/equipment/piping insulation.

    b. Hydronic piping.

    c. Steam and condensate piping.

    d. Hydronic pumps.

    e. Steam condensate pumps.

    f. HVAC water treatment.

    g. Fuel oil piping.

h. Boiler systems and equipment.

i. Air handling systems.

j. Chillers.

k. Cooling towers.

l. Condensers.

m. Heat exchangers.

n. Ductwork and ductwork accessories.

o. Fans.

p. Filters.

q. HVAC instrumentation and controls.

r. Testing, Adjusting and Balancing.

1.04 RELATED WORK OF OTHER SECTIONS

A. Division 0 - Bidding & Contract Forms and Division 1, General Requirements, govern the work of this section.

1.05 CODES

A. All work shall meet the requirements of the Uniform Construction Code of the State of New Jersey, all amendments thereto, which includes but is not limited to the following sub-codes, that are in effect at of the time of bidding:

IBC International Building Code

IMC International Mechanical Code

IFGC International Fuel Gas Code

ASHRAE 90.1 Energy Standard for Buildings

NSPC National Standard Plumbing Code

NEC National Electrical Code

B. All work shall comply with the applicable requirements of the following standards, unless more stringent provisions are shown or specified:

Local Water Company Rules and Regulations

OSHA Occupational Safety and Health Administration

NFPA National Fire Protection Association

UL	Underwriter's Laboratories, Inc. All materials and equipment shall be listed and shall bear the inspection label wherever standards have been established and label service is regularly furnished.
FMRC	Factory Mutual Research Corporation
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers.
SMACNA	Sheet Metal and Air Conditioning Contractors National Association.
ASTM	American Society for Testing and Materials
NEMA	National Electrical Manufacturers' Association
ANSI	American National Standard Institute
ASME	American Society of Mechanical Engineers
MSS	Manufacturers Standardization Society of the Valve Fittings Industry, Inc.
ADC	Air Diffusion Council
AMCA	Air Movement and Control Association, Inc.
ARI	Air Conditioning and Refrigeration Institute
AWWA	American Water Works Association
IBR	Institute of Boiler and Radiator Manufacturers

1.06 EXAMINATION OF SITE

A. Refer to Division 0, Bidding & Contract Forms, and Division 1, General Requirements.

1.07 LAWS, ORDINANCES, PERMITS AND FEES

A. Refer to Division 0, Bidding & Contract Forms, and Division 1, General Requirements.

B. Include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings, (in addition to Contract Drawings and Documents) in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on Drawings or specified.

1.08 EXECUTION, CORRELATION AND INTENT

A. Refer to Division 0, Bidding & Contract Forms, and Division 1, General Requirements.

1.09 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS

A. Refer to Division 0, Bidding & Contract Forms, and Division 1, General Requirements.

1.10 CONTRACT DRAWINGS

A. Refer to Division 0, Bidding & Contract Forms, and Division 1, General Requirements.

B. The drawings indicate required size and points of termination of pipes and ducts and suggest proper routes to conform to structure, avoid obstructions and preserve clearances. However, it is not intended that drawings indicate exact location and all necessary offsets, which might have to be made in order to conform to a structure, avoid obstructions, preserve headroom, maintenance access and keep openings and passageways clear.

C. Follow Drawings in laying out work and check Drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. Provide for access to all equipment for maintenance and repair. Where headroom and space conditions appear inadequate, Engineer shall be notified before proceeding with installation.

D. If directed by the Engineer, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

E. Piping or ductwork connected to equipment may require different size connections than as indicated on the Drawings. The Contractor shall provide transition pieces as required at the equipment.

1.11 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

A. Refer to Division 0, Bidding & Contract Forms, and Division 1, General Requirements.

B. Purchase the equipment and material required in accordance with field measurements taken at the proper time during the construction progress.

1.12 WORK IN PLENUM CEILINGS

A. Plastic pipe shall not be permitted in ceiling plenums or other air shafts.

1.13 ELECTRICAL WIRING

A. All wiring associated with mechanical equipment and systems, with the exception of the control system (power and control wiring), shall be furnished and installed by the Electrical Contractor.

B. All power and control wiring for the automatic temperature control system shall be furnished and installed by the Mechanical Contractor in accordance with the Electrical Specifications and approved shop drawings.

1. The Mechanical Contractor may utilize any circuit breakers noted on the Electrical Drawings as “Reserved for ATC Systems”. The Mechanical Contractor shall provide, at no additional cost, all other feeders, panelboards, circuit breakers, conduit and wiring as required for a complete and operating ATC System.

1.14 MOTORS, CONTROLLERS AND STARTERS

A. All motors shall be furnished by the Mechanical Contractor. All field installed motors shall be turned over to the Electrical Contractor for installation.

1. All motors shall be suitable for power available at the motor location as indicated on the Electrical Drawings or at the Engineer’s option and at no additional cost to the Owner, provide an additional power transformer to match the available power and motor.

B. All starters and combination starter disconnects shall be furnished by the Mechanical Contractor unless the equipment is supplied with power from a motor control center. All field installed starters and combination starter disconnects shall be turned over to the Electrical Contractor for installation.

1. Whenever possible, equipment shall be furnished with integral starters.

C. Disconnect switches shall be furnished and installed by the Electrical Contractor unless stated otherwise.

1.15 DELIVERY, STORAGE, AND HANDLING

A. Unless approved by the Owner, equipment shall not be delivered to site until required for installation.

B. Store equipment and materials in a secured, clean, dry place and as directed by the Owner. Protect from dirt, fumes, water, construction debris, and any other physical damage.

C. Handle equipment and materials carefully to prevent damage, breaking, denting and scoring. Do not install damaged equipment or materials; remove from site and replace with new.

1. Protect shop fabricated ductwork, accessories and purchased products from damage during shipping, storage and handling. Protect ends of ductwork and prevent dirt and moisture from entering ducts and fittings.

2. Where possible, store ductwork inside and protect from weather. Where necessary to store outside, store above grade and enclose with waterproof wrapping.

D. Comply with manufacturer’s rigging and installation instructions for unloading and handling equipment and materials to final locations for installation.

1.16 PROTECTION

A. Refer to Division 0, Bidding & Contract Forms, and Division 1, General Requirements.

1.17 ACCESSIBILITY

A. Locate equipment which must be serviced, operated or maintained in fully accessible positions. Equipment shall include, but not be limited to, valves, traps, cleanouts, motors, controllers, drain points, etc. If required for better accessibility, furnish access doors. Minor deviations from the Drawings may be made to allow for better accessibility. Changes shall not be made without review. Any such deviation shall be made at no additional cost to the Owner.

B. Ensure the size of shafts, chases, thickness of partitions, clearance in double partitions, hung ceilings for proper installation of work. Cooperate with Other Trades whose work is in the same spaces and advise the General Contractor of requirements. Keep spaces and clearances to minimum size required.

1.18 TEMPORARY OPENINGS

A. Ascertain from examination of the Architectural Drawings and/or by visiting the site whether any special temporary openings in the building will be required for the admission of apparatus provided under the Contract and notify the Engineer accordingly. In the event of failure to give sufficient notice to the Engineer in time to arrange for these openings during construction, assume all costs of providing such openings thereafter.

1.19 EXISTING SERVICES

A. When encountered in the work, protect brace and support existing active sewers, gas, electric, other services where required for proper execution of the work. If existing active services are encountered that require relocation, make the request in writing for a determination. Do not proceed with the work until written directions are received. Do not prevent or disturb operation of active services that are to remain.

B. When encountered in the work, remove, cap or plug inactive services. Notify utility companies, municipal agencies having jurisdiction and the Owner. Forward copy of such notice to the engineer. Protect or remove these services as directed.

C. Contact utility companies for verification of existence and locations of all underground utilities prior to commencing excavation.

D. Existing subsurface utilities encountered in the course of the work shall be considered active and shall be protected with extreme care. Any existing subsurface utility which is discovered by the Contractor and which is not indicated on the Drawings shall be reported to the Engineer immediately.

E. Damage to an existing utility, which may be related to the Contractors' activities, shall be repaired by the Contractor on an immediate and continuous basis. Materials and methods of repairs shall be identical to the materials and methods used at the time the existing utility line was originally constructed. All costs related to such repairs shall be borne by the Contractor at no additional cost to the Owner.

1.20 SHUTDOWNS

A. When installation of a new system requires the temporary shutdown of an existing operating system, the connection of the new system shall be performed at such regular time or at overtime as designated by the Owner.

B. The Owner shall be notified of the estimated duration of the shutdown period at least ten (10) days in advance of the date the work is to be performed.

C. Work shall be arranged for continuous performance, including overtime, when approved by the Owner, if required, to assure that the existing operating services will be shut down only during the time actually required to make necessary connections.

1.21 SCAFFOLDING, RIGGING, HOISTING

A. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery onto the premises of all equipment and materials furnished under this Section of the Specifications, and remove same from premises when no longer required.

B. Assume full responsibility for supplementary bracing of the basic building structure in the event that it is required to assure a secure rigging procedure and a secure route for the equipment being handled. Provide drawings and calculations signed and sealed by a professional engineer licensed in the state the project is located.

1.22 MANUFACTURERS' IDENTIFICATION

A. The manufacturer’s nameplate, name or trademark, shall be permanently affixed to all equipment and material furnished under this Specification. Where such equipment is in a finished occupied space, the nameplate shall be in a concealed but accessible location. The nameplate of a Subcontractor or Distributor will not be acceptable in lieu of the manufacturer’s nameplate.

1.23 TOOLS

A. All special tools necessary for the proper operation and maintenance of the installed equipment shall be delivered to the Owner’s representative at no additional cost to the Owner. The Contractor shall obtain a receipt for the tools.

1.24 RUBBISH REMOVAL

A. Refer to Division 0, Bidding & Contract Forms, and Division 1, General Requirements.

1.25 CLEANING OF PIPING, DUCTS AND EQUIPMENT

A. Clean all piping, ducts, and equipment of all foreign substances inside and out before being placed in operation.

B. If any part of a system should be contaminated with foreign matter after being placed in operation, the system shall be disconnected, cleaned, and

reconnected wherever necessary to locate and remove obstruction. Any work damaged in the course of removing obstructions shall be repaired when the system is reconnected, at no additional cost to the Owner.

C. During construction, properly cap all pipes and equipment nozzles so as to prevent the entrance of sand, dirt, etc.

D. Cover return air openings during construction so as to prevent the entrance of sand, dirt, etc.

1.26 PAINTING

A. All finish painting is specified under other Sections of the Specifications, except as follows:

1. Underground – Two coats of black asphaltum paint.

2. All lead bends and lead safes and flashing shall be painted with two coats of waterproof black asphaltum varnish.

3. The inside of all ductwork where visible through wall openings shall be painted with two prime coats of matte black paint.

B. Nameplates on all equipment shall be cleaned and left free of paint.

1.27 LUBRICATION

A. Assume responsibility for proper lubrication of all rotating equipment prior to startup and before electrical connections are made. Assume responsibility for any damage to any equipment that is not properly lubricated when started.

1.28 SEMI-FINAL AND FINAL SITE VISITS FOR OBSERVATION

A. As the project approaches completion, the Engineer, Architect, or other Owner's representative, at their discretion, shall determine a period of time in which they shall perform a Semi-Final Site Visit to observe the Mechanical installation. At the conclusion of this Semi-Final Site Visit, a Semi-Final Punchlist shall be issued to the appropriate Contractor for the deficiencies in the work of his trade. Complete all work and perform all corrective measures as required by the Semi-Final Punchlist. After this corrective and completion work has been accomplished, in writing, advise the Architect and the Engineer that every item on the Semi-Final Punchlist has been completed. After the Architect and Engineer make a Final Site Visit to observe the Mechanical installation and make a Punchlist, a similar letter of Compliance shall be forwarded through channels.

1.29 TESTS

A. Refer to Division 0, Bidding & Contract Forms, and Division 1, General Requirements.

B. All piping, wiring, and equipment shall be tested as specified under the various sections of the work. Labor, materials, instruments and power

required for testing shall be furnished under the particular Section of the Specifications.

C. Tests shall be performed to the satisfaction of the Engineer and/or the local authorities having jurisdiction. The Engineer and such other parties that may have legal jurisdiction will be present at such tests, when they deem necessary.

D. Pressure tests shall be applied to piping before final connections to equipment and installation of insulation. In no case shall piping, equipment, or accessories be subjected to pressure exceeding their ratings.

E. All work found to be defective as a result of the tests shall be repaired or replaced promptly and the tests repeated until the performance of the particular system and component parts prove to be satisfactory.

F. The duration of tests shall be determined by all authorities having jurisdiction, but in no case less than the time prescribed in each Section of the Specifications.

G. Equipment and systems which normally operate during certain seasons of the year shall be tested during the appropriate season. Tests shall be performed on individual equipment, systems, and their controls. Whenever the equipment or system under test is interrelated with and depends upon the operation, function or performance of other equipment, systems and controls for proper testing, they shall be operated simultaneously with the equipment or system being tested.

1.30 ALTERATIONS

A. All mechanical equipment and installations which become abandoned shall be entirely removed unless indicated otherwise in the Contract Documents. All such equipment, except as requested as salvaged by the Owner, shall become the property of the Contractor and the Contractor shall remove it from the premises immediately upon disconnection. Existing ductwork, piping, etc., being removed shall not be reused unless otherwise indicated on the Drawings.

1. Note that existing piping concealed within walls, nonaccessible ceiling assemblies and below floor slabs may be removed to within the assembly and capped to allow surface repair, if there is no interference with subsequent work, or other adjacent trades.

2. If construction, such as a hung ceiling, furred beam, chase, etc., is opened up and removed during the course of the construction, the abandoned pipe and ducts therein shall be treated as though they are exposed to view.

3. When required to accommodate new work, abandoned piping and ductwork concealed in construction shall be treated as though they are exposed to view.

B. All equipment and systems which are to be relocated or temporarily removed and replaced shall be inspected for serviceability and repaired, if required, and cleaned before reinstallation.

1. Scheduling shall be closely coordinated with the Owner.

C. When existing piping and duct systems, at points of connection to new work or in rerouting are found to be defective, the Contractor shall notify the Engineer immediately.

D. Contractor shall move or relocate any existing mechanical equipment, piping, ductwork, etc., which may temporarily interfere with the construction, (to a temporary location) if the existing equipment is to be kept in operation during construction. Contractor shall also install temporary offset piping, ductwork, etc. that might be required around the construction area in order to maintain services to the existing systems.

E. Protect the structure, furnishings, finishes and adjacent materials not indicated or scheduled to be removed.

F. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

G. Provide temporary supports where required.

H. Where alterations reveal piping, ductwork, conduit circuits, wiring, and accessories that must necessarily remain in service, same shall be rerouted, replaced or altered as required to make same completely concealed in the new work at no additional cost to the Owner.

I. Where existing piping or ductwork insulation is damaged by the requirements of the work, replace all damaged insulation to match existing.

1.31 TEMPORARY HEAT

A. Refer to Division 0, Bidding & Contract Forms, and Division 1, General Requirements.

1.32 ACOUSTICAL PERFORMANCE WITHIN EQUIPMENT SPACES

A. Equipment room noise levels and noise transmission to adjacent buildings shall comply with all Federal, State, and City Noise Ordinances.

B. Motor Acoustical Performance:

1. Motor drives for pumps and refrigerator machine when installed per plans and specifications shall operate with noise levels not to exceed 80 dbA at 3 feet.

2. Noise levels shall be determined in accordance with IEEE Standard #85 test “procedure for Air-Borne Noise Measurements on Rotating Electric Equipment”.

PART 2 - PRODUCTS

2.01 NAMED MANUFACTURERS AND SUBSTITUTIONS

A. Within the Contract Documents, certain manufacturers are named. All other manufacturers shall be considered substitutions. The project's design is dependent on consideration of capacities, ratings, dimensions and installation requirements for equipment and installation criteria. The drawings and specifications reflect named manufacturer's data. Substitutions are subject to the General Conditions of these specifications and as listed within this Section and shall be of other manufacturers of a product of equivalent type, quality, materials and design.

B. The Contractor's bid shall be based only on those manufacturers specifically mentioned in the specifications and/or on the drawings.

C. All equipment and materials required for installation under these Specifications shall be new and without blemish or defect. All electrical equipment shall bear labels attesting to Underwriters' Laboratories approval. Where no specific indication as to the type or quality of the material or equipment is indicated, a first class standard article shall be furnished.

D. All equipment of one type (such as fans, coils, etc.) shall be the product of the same manufacturer.

E. The Contractor shall assume responsibility for the additional investigative time, by the Engineer, required on submissions for other than the Named Manufacturers.

F. The Contractor shall assume responsibility for the delays caused by incorrect or incomplete information on submissions for other than the Named Manufacturers.

G. Substitutions of material and equipment of makes other than specifically named on the Drawings and in the Specifications and as provided for in the above paragraphs will be reviewed by the Engineer for the following reasons only:

   1. Availability: The material or equipment called for on the Drawings or in the Specifications cannot be delivered to the job in time to complete the work in proper sequence to the work of other trades, due to conditions beyond control.

   2. As requested by the Owner.

H. To receive consideration, requests for substitutions must be accompanied by documentary proof of equality, difference in price and delivery, if any, in the form of certified quotations from suppliers of both specified and proposed equipment and its effect upon adjacent related items. In case of a difference in price, the Owner shall receive all benefits of the difference in cost involved in any substitutions.

I. Where it is proposed to use an item of equipment other than that specified or detailed on the Drawings which requires any redesign of the structure, partitions, foundations, piping, wiring, or any other parts of the mechanical, electrical, or architectural layout, all such redesign and all new drawings shall be prepared at no additional cost to the Owner and submitted to the Engineer as shop drawings for review and comment.

J. Where such deviation from Contract Documents requires a different quantity and arrangement of ductwork, piping, wiring, conduit, and equipment from that specified or indicated on the Drawings, furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring, and conduit, and any other additional equipment required by the system, at no additional cost to the Owner.

K. If material or equipment is installed before the Contractor obtains an “Approved” or “Approve as Noted” comment from Engineer, and/or in the opinion of the Engineer the material or equipment does not meet the intent of the Drawings and Specifications, the removal and replacement shall be made at no extra cost to the Owner.

L. The materials, workmanship, design, and arrangement of all work installed under the Contract shall be subject to the approval of the Engineer.

2.02 SHOP DRAWINGS, SUBMITTALS AND MATERIAL LISTS

A. Provide three (3) sets of prints for all shop drawings larger than 11" X 17" and six (6) sets of all shop drawings or catalog cuts that are 11" X 17" or smaller of the following:

1. Shop drawings (minimum scale of 3/8" = 1'-0", except as noted).

a. Sheet metal layouts and components.

b. Mechanical equipment rooms, equipment, piping and supports.

c. Automatic temperature control diagrams, indicating wire and conduit sizes and component, including sequences of operation. (No scale)

2. In accordance with SMACNA duct pressure classes, the sheet metal duct layouts shall clearly indicate points at which duct construction requirements vary.

B. All required submissions are to be made whether or not the named manufacturers equipment is to be used on the project.

C. The required product submissions, which are multiple items of one or several manufacturers, shall be incorporated into a booklet complete with a Table of Contents. The Table of Contents shall include item number from drawings, manufacturers’ names, model name and/or number, and catalog number.

D. Facsimile (fax) submittals will not be accepted.

E. Prior to delivery to job site, but sufficiently in advance of requirements necessary to allow the Engineer ample time for review, submit copies (as

stated in the “General Conditions”) of shop drawings of all equipment, materials, piping, sleeves, conduit, ductwork, and wiring diagrams, and further obtain written comments “Approved” or “Approved as Noted” for same from the Engineer, before installing any of these items.

F. Certified performance curves for all pumping and fan equipment shall be submitted for review.

G. Shop drawings submitted in insufficient number of copies shall be rejected

H. Samples of materials or equipment, when requested by the Engineer, shall be submitted for review.

I. Catalogs, pamphlets, or other documents submitted to describe items on which review is being requested, shall be specific and identification in catalog, pamphlet, etc., of item submitted shall be clearly made in ink. Data of a general nature will not be accepted.

J. Shop drawings indicating an unsuitable manufacturer shall be rejected without review.

K. If a shop drawing is resubmitted and does not comply with all of the comments indicated on the previous submission(s), and does not reflect specific reasons for such non-compliance, it shall be rejected without review.

L. Label resubmitted shop drawings with a stamp indicating the submittal number, for example: SECOND SUBMISSION; THIRD SUBMISSION, etc. and send separate transmittals for each item being submitted so that one transmittal does not cover more than one specific item or group of items from one manufacturer.

M. Failure to submit shop drawings in ample time for review shall not entitle an extension of Contract time, and no claim for extension by reason of such default will be allowed.

N. Before request for acceptance and final payment for the work, write a letter to the Engineer stating that all shop drawings have been brought to the condition of “Approved” or “Approved as Noted” status. Any outstanding shop drawings must be cleared with the Engineer.

2.03 OTHER SUBMITTALS REQUIRED

A. Submit maintenance and operating manuals prior to the completion of all work and the final inspection of the installation by the Owner. Provide eight (8) copies unless otherwise noted, bound in booklet form and suitably indexed to the Engineer for review. All written material contained in the manual shall be typewritten or printed. The manual shall contain the following items:

1. Introduction - Explanation of the Manual and its use.

2. Description of the Systems

a. Complete schematic drawings of all systems.

b. Functional and sequential description of all systems.

c. Relationship of systems where applicable to the supervisory data system.

3. System Operation

a. Start-up procedures.

b. Shut-down procedures.

c. Reset, adjustment and balancing procedures.

d. Seasonal operation.

e. All instruction charts to be posted.

4. Maintenance

a. Cleaning and replacement - lines, components, filters, strainers, ducts, fans, etc.

b. Lubrication.

c. Charging and filling.

d. Purging and draining.

e. Systems trouble shooting charts.

f. Instruments required for checking and calibration.

g. Procedures for checking out automatic functions with remote control.

h. Recommended list of spare parts.

5. Manufacturer's Data (Where multiple model, type and size listings are included on the cut sheets, clearly and conspicuously indicate those that are pertinent to this installation).

a. Description - Literature, drawings, illustrations, certified performance charts, technical data, etc.

b. Operation.

c. Maintenance, including complete trouble-shooting charts.

d. Parts Lists.

e. Names, addresses and telephone numbers of the local recommended repair and service companies and product representatives.

f. Guarantee data.

g. Model No. and Serial No. of all equipment.

B. Record Drawings:

1. Maintain one (1) set of Contract Drawings on the job, neatly and legibly marked with all field changes. At the completion of the project record drawings shall be prepared by the Contractor from the marked set.

2. The Contractor shall furnish, coordinate, produce and distribute record drawings as stated within the General Conditions of the Contract.

C. During construction the Contractor shall keep an accurate record of all final locations and inverts of all buried work. Secure dimensions from given fixed bench mark such as corner of building.

D. Testing and Balancing Reports: Submit eight (8) copies unless otherwise noted in General Conditions.

PART 3 - EXECUTION

3.01 ORGANIZATION OF WORK

A. Refer to Division 0, Bidding & Contract Forms, and Division 1, General Requirements.

3.02 FIELD MEASUREMENTS, LAYOUT AND POSITIONING

A. Exercise particular care in locating all materials and apparatus in relation to architectural, structural and electrical features and their function. Failure to observe this or the following provisions will mean relocation of the item at the Contractor's expense, including reimbursement of all expenses of others affected thereby.

B. Verify types and materials for ceilings, walls and floors, both existing and new, and make new or revised installations compatible.

C. Where Owner's supplied equipment or other equipment is to be provided, the exact location of the associated roughing shall be done in accordance with the manufacturer's drawings, diagrams, or instructions. Installation of roughing for equipment that is done without use of this specific information shall be done solely at the Contractor's risk. If the equipment is to be provided at a future date, exact locations shall be requested before proceeding.

D. All equipment and systems shall be installed in locations which provide required and recommended service or safety clearances and that require the least intrusive space utilization. To comply, vertical, suspended and floor mounted installations shall be close to walls and corners and horizontal suspended installations shall be at maximum height relative to roof or floor decks and their associated structural members.

E. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.

F. Install equipment and run pipes parallel with or at right angles to the lines of the building unless otherwise shown on the Drawings.

G. Comply with the NEC vertical and horizontal clearance requirements when installing mechanical equipment adjacent to electrical equipment.

3.03 ACCESS DOORS IN FINISHED CONSTRUCTION

A. Install all work so that all parts required are readily accessible for inspection, operation, maintenance and repair. Minor deviations from the Drawings may be made to accomplish this, but changes of magnitude shall not be made without prior written review from the Engineer.

B. Wherever mechanisms requiring access for maintenance, reading of instruments, or for operation are concealed in the structure and wherever else indicated on the Drawings, supply access doors of sizes necessary to provide ready access to the concealed items. Group together valves, controls, dampers, traps, expansion joints, cleanouts, gauges, switches, and other equipment requiring access in walls and furred spaces to reduce the number of access doors.

C. Access doors shall be installed in building structure under a separate Section. Provide location and quantity to Installing Contractor.

3.04 CUTTING AND PATCHING

A. Refer to Division 0, Bidding & Contract Forms, and Division 1, General Requirements.

B. As a general rule, chases, shafts and wall openings as shown on the Drawings will be provided for most of the ducts and piping. This Contractor shall coordinate with the Construction Supervisor any additional enclosures or openings required.

3.05 FIRESTOPPING

A. Firestopping shall be applied at all pipe and duct penetrations through fire-rated wall floor assemblies.

3.06 INSTRUCTION OF OWNER'S PERSONNEL

A. After completion of all work and all tests and at such time as designated by the Engineer, provide the necessary skilled personnel to operate the entire installation for a period of two (2) consecutive days, eight (8) hours each. This instruction is in addition to any required by subsequent specification sections.

B. During the operating period, fully instruct the Owner's representative in the complete operation, adjustment and maintenance of the entire installation.

C. The Contractor shall submit a draft copy of the S.O.P.'s at this time.

3.07 OPERATION PRIOR TO COMPLETION

A. Refer to Division 0, Bidding & Contract Forms, and Division 1, General Requirements.

3.08 WARRANTY

A. Refer to Division 0, Bidding & Contract Forms, and Division 1, General Requirements.

B. The Contractor guarantees by his acceptance of the Contract that all work installed will be free from any and all defects and that all apparatus will develop capacities and characteristics specified, and that if during a period of one year from date of final acceptance of the work by the Owner any such defects in workmanship, material or performance appear, the Contractor shall replace, repair, or otherwise correct the defect or deficiency without cost to the Owner within a reasonable time. Notify the Engineer in writing of the time required to do the work. For heating systems the guarantee period must include one continuous heating season from October 15th to April 15th. For cooling systems the guarantee period must include one continuous cooling season from May 1st to October 1st.

C. Replace or repair to the satisfaction of the Owner any and all damage done to the building or its contents or to the work of other trades in consequences of work performed in fulfilling the guarantee.

D. In addition to any specific warranty required by the mechanical specifications, the manufacturers of all equipment supplied under this Contract shall warrant the same against all costs, including labor and material, arising out of defects in material and/or workmanship, coexistive with the guarantee required in the Contract Documents.

E. In the event of default on this Guarantee, the Owner may have such work done as required & charge the cost to the Contractor.

F. The date of acceptance shall be the date of final payment by the Owner or notice of acceptance by the Owner, whichever is later.

END OF SECTION

SECTION 15050 - BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies the Division 15 Work coordination requirements with general work provisions.

1.02 DESCRIPTION OF REQUIREMENTS

A. Provide finished work, tested and ready for operation including apparatus, appliances, materials, and work. Provide incidental accessories necessary to make the work complete and ready for operation without additional expense to the Owner.

B. Before beginning work or ordering materials, consult Architect for clarification of discrepancies between, or questionable intent, of the Contract Documents.

C. Contractor shall visit the site and field survey the existing site conditions prior to bid. Any site conditions which may cause significant deviation from the design drawings shall be brought to the attention of the Owner's representative for clarification prior to bid.

D. Substitution of Equipment Items

1. First named manufacturer/product forms basis of design. All other manufacturers' products are substitutions.

2. Where Contractor proposes to substitute an equipment item different from that shown on Drawings, provide any redesign, including Drawings, of structure, partitions, foundations, ductwork, piping, wiring controls or any other part of mechanical, electrical, or architectural layout required.

3. Submit Drawings and details of redesign required due to substitution of equipment items to Architect for approval.

4. Provide ductwork, piping, structural supports and related calculations, insulation, controllers, motors, starters, equipment, electrical wiring and conduit, and any other additional components required by approved substituted system, at no additional cost to the Owner.

5. Expense for Architect/Engineer review shall be additional service and shall be approved by the Owner, to be paid by the Contractor.

6. Provide structural calculation as resulted by substitution. Structural calculation shall be prepared and stamped by a structural engineer licensed in the State of Hawaii.

1.03 DRAWINGS AND SPECIFICATIONS

A. Where a conflict exists between Drawings and Specifications, promptly notify Architect for interpretation and resolution. The most stringent requirements shall be used for bid.

1.04 COORDINATION SHOP DRAWINGS

A. General: Prepare arid submit for review coordination drawings where work by separate entities requires fabrication of products and materials which must accurately interface or for which space provided is limited. Coordination drawings shall indicate how the work will interface and installation will be sequenced. It is the intent of this provision to find, bring forth, and resolve potential constructability problems prior to actual construction, thereby allowing for the resolution of issues before construction cost and schedule are impacted.

B. General Contractor will oversee preparation of coordination drawings, assign priority space and bring to the attention of the Architect any conflicts or interferences of an unresolved nature found during preparation of coordination drawings. Expedite conflict or interferences and submit solutions/recommendations for approval review.

C. Drawings: Shop drawings shall include but are not necessarily limited to the following:

1. Submit 1/4” = l’-0” minimum scale, a combined, comprehensive mechanical and electrical systems coordination drawing. Coordination drawing shall include all ductwork, mechanical piping, plumbing, electrical controls, electrical power distribution, lighting, telecom/data, fire alarm, and sprinkler systems, and ceiling systems overlaid on structural frame and architectural plan.

    a. Criteria: Ductwork, mechanical piping, plumbing, electrical controls, and sprinkler system components shall be sized as shown on Drawings. Seismic restraints shall be shown where required. Nonconforming Mechanical/Electrical work installed within designated coordination areas is subject to removal and replacement by the installing contractor at no additional cost to Owner.

    b. Provide sections for congested areas.

    c. Identify typical areas, start preparation of coordination drawings for such areas first.

D. Coordination drawings shall be signed and dated by individual trade contractors. By act of signature and submittal of singular combined coordination drawing, each trade contractor acknowledges their coordinated portion of the work with all other mechanical, electrical, architectural, and structural work contractors.

E. After completion of coordination shop drawings signed by individual trade contractors. Submit copies to architect for records and provide at the job site for reference. No work will be performed without the complete coordination shop drawings.

F. No request for information regarding the routing of pipes, ductwork and placement of equipment will be reviewed and responded to without a completed shop drawings.

1.05 WARRANTY

A. Coordinate warranty requirements with Division 1.

B. Provide manufacturer's written warranties covering defects in material and workmanship of products and equipment utilized for the project.

C. Warranties shall be for a period of 1 year from the date of substantial completion unless more stringently specified within individual Sections of this Division.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.01 TRADE COORDINATION

A. General

1. Refer to Division 1 - Coordination for coordination drawing requirements.

2. Refer to Division 1 for substitution requirements.

3. Verify the location of the various building components and items to be installed by other trades.

4. Coordinate work sequence and schedule for a minimum of interference with work of other trades.

5. Ascertain temporary opening sizes and locations necessary for admission of mechanical equipment and coordinate requirements with work of other Divisions.

6. Should conditions require revisions to space to suit the design of equipment proposed for installation, submit detailed shop drawings showing revisions before proceeding with work.

7. Obtain written consent from Architect before decreasing sizes or changing installation.

8. Changes to work, which become necessary due to failure to coordinate work, shall be done at the installer's expense.

9. Coordinate with installers for other Divisions and Sections to define space requirements and clearance requirements with respect to other equipment in the building. Submit conflicts regarding space requirements to Architect for resolution.

10. Coordinate with testing and balancing contractor to review drawings for proposed additional balancing components required for proper system testing and balancing.

B. Visiting the Premises:

1. Visit premises prior to bid and become thoroughly familiar with the general layout of the building site and the location of existing utilities to which connections are to be made.

   a. Check grades, ditches, pavements, and other conditions which might affect utility installations before ordering material or starting work.

2. Verify measurements at the project prior to fabrication.

   a. Where sequence of measuring before fabrication would delay Project, request Owner's authorization to proceed with fabrication allowing ample tolerances and providing offsets to accommodate as-built conditions.

   b. Contractor shall assume full responsibility for investigation of existing conditions and requirements.

   c. Notify Architect of significant differences before proceeding with corrective measures.

C. Interferences:

1. Determine exact locations of equipment, ductwork and piping on the job, being affected by structural conditions of the building. Coordinate with work of other trades.

2. Do not prevent or disturb operation of active services which are to remain.

   a. If temporary shutdown of services is unavoidable, consult with Owner as to dates, procedures and estimated duration of down time period at least ten working days prior to date of shutdown.

   b. Schedule work such that existing operating services will be shut down only during time it is necessary to make connections.

   c. If a system cannot be shut down, install temporary bypasses until final connections are complete.

3. Determine exact location of existing service lines or installations encountered in performance of work and provide suitable protection, support and maintenance.

4. Immediately repair or replace, at no additional cost to Owner, utility services or installations damaged in performance of work. Obtain written approval of repair or replacement from Architect and utility company.

5. If existing active utility services are encountered which require relocation, follow procedures provided by authorities having jurisdiction.

    a. Terminate existing services to be abandoned in conformance with requirements of authorities having jurisdiction.

6. All removed equipment shall remain the Owner's property unless otherwise stated in other articles of these Specifications.

D. Cutting and Patching: Refer to Division 1.

E. Access to Mechanical Equipment:

1. Work of this article is limited to access of mechanical equipment through walls and inaccessible ceilings and does not include access within mechanical equipment systems (see individual work Sections of Division 23).

2. Furnish adequate access door requirements to other trades involved prior to performance of their work for coordination and to minimize cutting and patching.

3. Submit exact location of each access door to other trades and to Architect for approval prior to installation.

    a. Consider visual impact when determining access door locations.

    b. Prearrange unit locations to minimize quantities.

    c. Sizes

        1) Ceiling access doors: No less than 24 by 24 inches.

        2) Wall access doors: Size to suit equipment but not less than 12 by 12 inches.

4. Provide access doors in inaccessible ceilings and walls to gain access to all dampers, fire dampers, smoke and fire/smoke dampers, terminal units, coils, filters, valves, air vents, control devices, traps, cleanouts, drains and other similar devices requiring periodic observation, adjustment, service or replacement.

F. Service Connections:

1. Except as otherwise indicated by technical provisions of individual Sections within Division 15, final connection of mechanical services to general work (Divisions 2 through 16) is hereby defined as work of those Sections. Final hookup of pre-purchased equipment and Owner furnished/contractor-installed (OFCI) equipment is hereby defined as work of Division 23 unless otherwise provided. Rough-in of mechanical services for all equipment which is specified as general work, scheduled as OFCI is defined as work of Division 23.

2. Determine rough-in locations from minimum 1/4-inch scale vendor-certified Drawings. Obtain large scale vendor-certified rough-in Drawings before progressing with any work for rough-in connections for all equipment.

3. Refer to Division 1 for additional requirements.

3.02 MECHANICAL PROCEDURES

A. Testing Requirements:

1. Arrange for testing of installed systems in accordance with requirements of authorities having jurisdiction and the requirements of Division 23.

a. Schedule testing procedures to provide a minimum of 7 days notice to the Architect.

b. Testing procedures shall include provision of labor, materials, instruments, and power necessary for successful completion.

c. Test duration shall be per Specifications except when the authority having jurisdiction requires a longer test period.

d. Comply with additional testing requirements of Division 1 for Procedures and Controls.

2. Specific Requirements:

a. Test equipment and systems which normally operate during certain seasons of year during the appropriate season. Perform tests on individual equipment, systems and their controls. Whenever equipment or systems under test are interrelated with other equipment or systems, the latter shall be operated simultaneously with equipment or systems being tested.

b. No piping or ductwork is to be insulated, closed up, furred in or covered before testing. Pressure test piping before connecting to equipment. Subject no piping, equipment, or accessories to testing beyond rated pressures.

c. Drain water used for testing from system after tests are complete. Work required to repair or replace damage caused by freezing of water left in system shall be done at Contractor's expense.

d. Repair or replace defective work and repeat tests until particular system and component parts thereof receive approval of Architect, regulating authority, Inspector of Record and Owner retained Testing Agencies. Repair any damage resulting from tests and replace all damaged materials to satisfaction of Architect and at no cost to Owner.

e. Make final tests in presence of appropriate inspector.

f. Refer to Section 15990 Testing, Adjusting and Balancing.

g. Refer to Section 15062 Hangers and Supports for HVAC Piping and Equipment

h. Furnish copies of test reports and certificates of acceptance, signed by the inspector, to Architect before making claims for final payment; such claims will not be processed until these submittals have been made.

B. Substitutions: Refer to Division 1.

C. Submittals

1. Submit shop drawings, brochures, and schedules as defined by individual technical Sections of Specifications.

2. Submit manufacturer's printed installation instructions for products and install in accordance with requirements of Division 1, and as defined by individual technical Sections of the Specifications.

3. If more than two (2) submissions of shop drawings and supplemental data are required for any given item to meet the project specifications, the expense for Architect/Engineer to review these additional submissions shall be additional service and shall be approved by the Owner to be paid by the Contractor.

D. Codes, Fees, and Related Costs

1. Comply with applicable codes, rules, regulations, and building and safety laws relating to construction, public health and safety.

2. Before request for acceptance and final payment of Contract:

a. Give notices, obtain permits, and pay taxes, fees and other costs in connection with the work;

b. File plans, prepare documents and obtain approvals of regulating authorities having jurisdiction;

c. Obtain Certificates of Inspection for work and deliver to Architect.

3. Provide all labor, materials, services, apparatus, and Drawings (in addition to Contract Documents) to comply with applicable laws, ordinances, rules, and regulations.

4. Contract Documents take precedence when more stringent than codes, ordinances, standards, and statutes.

3.03 MECHANICAL GENERAL EQUIPMENT PROVISIONS

A. Material and Equipment: All material and equipment shall be new.

1. Provide materials and equipment that are standard products of a reputable manufacturer regularly engaged in the manufacture thereof. Multiple items shall be the product of the same manufacturer.

2. Install material and equipment in accordance with manufacturer's recommendations. Contact Architect immediately if variance occurs between Contract Documents and manufacturer's recommendations so that variations in installation can be known by all parties concerned.

3. Deliver materials or equipment to the Project in the manufacturer's original, unopened, labeled containers.

a. Immediately reject materials which do not meet the quality level specified or received in damaged, unsealed, or open containers and ship back to factory at no cost to Owner.

b. Added costs associated with reordering, expediting orders, or project delays due to rejected materials shall be borne by the Contractor.

c. Protect from damage which may be caused by theft, weather, and building operations. Failure to protect materials and apparatus adequately shall be sufficient cause for rejection of any damaged material or equipment

d. Close pipe and equipment openings to prevent intrusion of obstructions and damage.

4. Owner or Architect will require removal and replacement of such material or work from the premises, which is not in accordance with Contract Documents. Replace unsatisfactory work without delay, at no additional cost to the Owner.

5. Coordinate nameplate requirements with Division 1.

B. Provide drip pans directly below overhead piping or similar sources of possible damage to protect work which is sensitive to moisture.

1. Pans shall be 2 inches deep, extending a minimum of 6 inches beyond each edge of overhead piping, lengthwise 18 inches beyond each side of electrical work to be protected, and sloped toward drain at 1/8 inch per foot.

2. Fabricate pans of either 20 gauge copper or 16 gauge zinc-coated steel, with rolled edges and reinforced for proper support, soldered fully watertight, and fitted with a 3/4 inch copper drain pipe and overflow pipe properly discharged. Overflow drain must terminate 1/2 inch lower than drain pan rim.

C. Provide drip pans for fan coil units, roof and overflow drain, and sanitary soil and waste piping, including condensate drains, located above sensitive areas, special procedures rooms, operating rooms, intensive care units, recovery rooms, computer rooms, telecommunications rooms and electrical rooms to protect the areas below. Drip pans shall be constructed as specified above.

D. Coordinate flashing and counter-flashing for mechanical penetrations of roofing membrane with roofing membrane installer.

E. Minor piping associated with instrumentation and control is generally not shown. Interconnection of sensors, transducers, control devices, instrumentation panels, combustion control panel, burner control panels is the responsibility of the contractor. Small piping associated with water cooling, drips, drains and other minor piping may not be shown to avoid confusion in the plan presentation but shall be provided as part of contract work. Drains shall be piped to the nearest floor drains.

3.04 SEALING AND PENETRATING

A. Fire rated: Provide UL tested assembly for all penetrations through fire rated floors and walls.

B. Non-rated: Provide mineral fiber sating (minimum of 3 lbs. Density) at all non-rated floors and walls.

3.05 PAINTING

A. General:

1. Labor, materials and equipment necessary for field painting.

2. Protect flooring and equipment with drip cloths.

3. Paint and materials stored in location where directed.

4. Oily rags and waste removed from building every night.

5. Furnish each space containing stored painting materials furnished with 2-1/2 gallon fire extinguisher bearing label of National Board of Fire Underwriters.

6. Wire brush and clean off all oil, dirt and grease areas to be painted before paint if applied.

7. Mixing:

    a. Mixed and strained as required by manufacturer.

    b. Use thinners only in accordance with manufacturers recommendation.

    c. Follow printed instructions on paint containers.

        1) If none are available, instructions shall be obtained in writing from manufacturer.

8. Workmanship:

    a. No painting or finishing shall be done with:

        1) Dust laden air.

        2) Unsuitable weather conditions.

        3) Space temperature below 60 degrees F.

    b. Pipes painted containing no heat and remain cold until paint is dried.

    c. Paint spread with uniform and proper film thickness showing no runs, sags, crawls or other defects.

    d. Finished surfaces shall be uniform in sheen, color, and texture.

    e. All coats thoroughly thy before succeeding coats are applied, minimum 24 hours between coats.

    f. Priming undercoat of slightly different color for inspection purposes.

B. Paint:

1. Best grade for its purpose.

2. Deliver in original sealed containers.

3. Apply in accordance with manufacturers instructions.

4. Colors: as selected by Architect and coordinated with Facility Engineering.

C. Finish painting:

1. Consisting of two finished coats of high gloss medium or long alkyd paint over prime coat.

2. Submit color shade for approval.

3. Color coding shall be in accordance with ANSI A13.I standard for piping and related equipment. (Scheme for identification of piping systems.)

   a. Red for fire-protection materials.

   b. Yellow or Orange for dangerous materials.

   c. Green and Blue for safe materials.

   d. Dark Blue or Purple for extra valuable materials.

   e. Gray for general equipment.

4. Shade shall be consistent throughout the project.

D. Field painting of Mechanical Work

1. Mechanical equipment with factory paint finish surface damaged during installation shall be repaired with matching paint finish.

2. Interior of galvanized steel ductwork behind diffusers, grilles, louvers visible from below shall be painted flat black.

3. All fire sprinklers piping, stand pipes, valves and trims not concealed above ceiling and fireman connections shall be painted red such as.

   a. Fire protection piping in mechanical equipment rooms, electrical rooms, I.T. Equipment rooms, stairways and on fireman connections on the roof.

4. Cut edges of steel components factory provided with galvanize compound and galvanize paint.

5. Materials with stainless steel, aluminum and hot dipped galvanized steel construction need not to be painted.

6. Provide field painting for the following mechanical work located on the roof.

   a. Uninsulated steel piping.

   b. Galvanized steel ductwork.

   c. Exhaust fan’s isolation steel bases.

d. Air handling unit structural steel supports and anchors hold down.

3.06 START-UP PROVISIONS FOR MECHANICAL WORK

A. General: Major equipment (such as air handling units) start-up shall be performed by the equipment manufacturer, authorized representative, or TAB contractor under supervision of Generator and mechanical contractor.

B. Adjusting and Aligning Equipment: Adjust all equipment. Check all motors for proper rotation.

C. Cleaning:

1. Remove tools, scaffolding, surplus materials, barricades, temporary walks, debris, and rubbish from the Project promptly upon completion of the work of each Section. Leave the area of operations completely clean and free of these items.

2. During all phases of on-site storage and all courses of construction, protect open ends of ducts and cap pipe to ensure adequate protection against entrance of foreign substances.

3. Disconnect, clean and reconnect wherever necessary to locate and remove obstructions from any system stopped by any foreign matter after being placed in operation. Repair or replace any work damaged in course of removing obstruction at no additional cost to the Owner.

D. Lubrication:

1. Extend grease fittings on bearings to points of ready and easy accessibility.

2. Lubricate fan bearings, etc., before operation of any equipment.

3. Provide a final lubrication to equipment immediately before turning over to Owner.

E. Operation by Owner:

1. Owner may require operation of certain systems or parts thereof, prior to Final Acceptance.

2. Operation is not to be construed as acceptance of work.

F. Instructions of Owner’s Personnel:

1. Prior to acceptance of work, and during time designated by the Architect, provide necessary qualified personnel to operate each system and fully instruct Owner’s personnel for a minimum period specified in other sections and based on system type and complexity.

2. During operating period, fully instruct Owner's Representative in complete operation, adjustment, care, and maintenance of each respective system and piece of equipment.

G. Instruction, Operating, and Maintenance Manuals: Comply with requirements of Division 1. Prior to completion of installation and final inspection of work, furnish to Architect 4 copies of complete Instruction Manual, bound in booklet form and indexed for each respective Mechanical Specification Section. Manuals shall contain the following:

1. List of equipment with manufacturer's name, model number, local representative, service facilities, and normal channel of supply for each item.

2. Manufacturer's literature describing each item of equipment with detailed parts list.

3. Name, address, and phone number of contractors involved in work under this Division.

4. Detailed step-by-step instructions for starting and shutdown of each system.

5. Copy of valve chart.

6. Individual equipment warranties.

7. Certificates of Inspection.

8. Spare parts list.

9. Air and water balance report.

10. Full size Record as built shop drawings in hard copies and in AutoCad 2000 CAD files. Markup shop drawings not acceptable.

3.07 WELDING FOR MECHANICAL WORK

A. All mechanical welding and inspection requirement shall be in accordance with the requirements of the State of Hawaii.

B. Qualify welding procedures, welders and operators shall be in accordance with ASME boiler and pressure vessel code, Section IX, welding and brazing qualifications. Welding procedures and testing shall comply with ANSI Standard B31.9 - standard code for pressure piping, and the American Welding Society (AWS) welding handbook.

C. Soldering and brazing procedures shall conform to ANSI B9.1 standard safety code and NFPA99.

D. All welders shall be certified. Fabricator shall have current and valid certificated registration by the building official. Prior to start of the project, the

fabricator shall submit a copy of certificate of registration for approval. Prior to project close out, the fabricator shall submit a certificate of compliance that the work was performed in accordance with the approved plans and specifications to the building official and to the Engineer of record.

END OF SECTION

SECTION 15051 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.01 SUBMITTALS

A. This Section includes piping, valves, and sprinkler heads for fire sprinkler systems.

1.02 SUBMITTALS

A. Submit shop drawings of entire sprinkler system, signed by a professional engineer registered in the State of Hawaii to the Hawaiian Insurance Rating Bureau for approval.

B. Support and Bracing:

1. Support and bracing of fire sprinkler piping shall comply with the latest edition of NFPA 13. Provide anchorage details and calculations for the connection of sway bracing to the structure. Design loads for the anchorage to be computed by Table 6-4.5.8 of NFPA 13. All shop drawings of the sprinkler system shall be submitted to the Building Department, local fire marshal and Owner's representative for review and approval prior to installation.

C. After review/acceptance by the State/local fire marshal, comply with provisions of Division 1.

D. Submit system test verification.

E. Submit record drawings in accordance with Division 1.

F. Submit letter of 3rd party inspection.

1.03 QUALITY ASSURANCE

A. Provide sprinkler equipment and installation in accordance with recommendations of the Owner and as approved by State and local fire marshal.

B. Equipment and installation shall meet requirements of NFPA 13 - Standard for the Installation of Sprinkler Systems, and NFPA 24 - Private Service Mains and Their Appurtenances.

C. The system shall be hydraulically designed wet system and subsequently installed in accordance with the hazard classification involved.

1. Submit calculations to Owner and the State and local fire marshal for approval prior to start of installation.

2. Drawings and calculations shall be signed by a professional engineer registered in the State of Hawaii.

3. Where portions of the sprinkler system are located within unheated areas, i.e., soffits, canopies, chases, or are exposed to the weather subject to freezing temperatures, include adequate measures in the system design to protect those portions from the weather.

4. Sprinkler zones shall coincide with smoke zones.

D. Contractor is responsible for hiring a 3rd party fire sprinkler system inspector.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Sprinkler Heads and Accessories:

1. Automatic Sprinkler

2. Grinnell

3. Reliable

4. Viking

B. Grooved Fittings:

1. Grinnell

2. Gustin-Bacon

3. MG Coupling

4. Victaulic

C. Fire Department Connection:

1. Allenco

2. Mueller

3. Potter-Roemer

4. Grinnell

D. Tamper Switches:

1. Acme Fire Maim

2. Edwards

3. Gamewell
4. A.D.T.
5. Potter

E. Flow Switches:

1. Notifier
2. Gamewell
3. A.D.T.
4. Potter

F. Valves:

1. Walworth
2. Kennedy
3. Nibco
4. Grinnell
5. Crane

2.02 SPRINKLER HEADS

A. Fusible Link Temperature Ratings:

1. Select to suit specific hazard area in accordance with NFPA 13.
2. Place sprinklers in upright or pendant position as required, with the deflector parallel to the ceiling.
3. Maintain clearances between the deflectors or other obstructions in accordance with NFPA Standard No. 13.

B. Suspended Ceilings: concealed pendant type with chrome-plated finish and closures plate with pure white enamel finish. Solder closure plate to the head enclosure at 3 points and shall drop off when temperature reaches 135 degrees F.

C. Exposed Areas: Standard upright type with brass finish. For sidewall application, provide sidewall type with chrome-plated finish and escutcheon.

D. Spare Automatic Sprinklers:

1. Provide in accordance with NFPA Standard No. 13, representative of head types installed.

2. House in a suitable lockable metal cabinet.

3. Provide no fewer than 2 special sprinkler head wrenches, or at least 1 head wrench for each cabinet or sprinkler type, whichever is greater.

2.03 VALVES AND TAMPER SWITCHES

A. Valves:

1. Threaded through 1 inches, grooved or shouldered in sizes 2-1/2 inches and larger to match pipe and fittings specified.

2. Provide enamel on metal identification sign on all valves in accordance with NFPA Standard No. 13.

3. All valves except zone control, main entrance service, and test and drain valves shall be sealed open.

B. Gate Valves: OS&Y, UL labeled, or Factory Mutual Research Corporation approved, 175 psi WWP.

C. Butterfly Valves: Gear operated, indicating type, UL labeled, or Factory Mutual Research Corporation approved, 175 psi WWP, as approved by NFPA.

D. Check Valves: UL labeled, or Factory Mutual Research Corporation approved, 175 psi WWP.

E. Tamper Switches: Provide for service entrance riser valve and zone valves. Switch shall close contacts when valve tampering occurs.

F. Air Compressor: Provide an air compressor, sized for system volume and pressure, for dry or pre-action sprinkler systems, or connect to reliable instrument air source if available.

2.04 SPRINKLER PIPING, ABOVE GROUND

A. Steel Pipe: ASTM A135 or ASTM 795; UL listed, having Corrosion Resistance Rating (CRR) 1.00 or greater; FM approved.

1. Coating: Hot-dip galvanized to meet ASTM A795 where used in dry systems; black carbon steel elsewhere.

2. Steel Fittings: ANSI/ASME B16.3, screwed type.

3. Cast Iron Fittings: ANSI/ASME B16.4, screwed fittings.

4. Malleable Iron Fittings: ANSI/ASME B16.3, screwed type.

5. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, “C” shaped composition sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

6. Schedule 10 PIPING FOR RISERS AND MAINS 2½” AND LARGER AS ALLOWABLE PER NFPA-13.

B. Copper Pipe: ASTM B88, Type L, 3” and smaller.

1. Fittings: T-drill fittings with B-cup 3 brazing.

2.05 SUPPORTS, HANGERS AND SEISMIC BRACING

A. Pipe Hangers: Spacing and details of support and bracing of sprinkler piping shall comply with the latest edition of NFPA 13 and a SMACNA Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems or No. R-003, the Superstrut Seismic Restraint System. U-type hangers used as sway bracing must have legs bent out 10 degrees and must have a slenderness ratio not exceeding 200.

B. The use of power-driven devices is not acceptable.

C. Hangers shall not be attached directly to roof decking, but to structural members capable of supporting the loads.

D. A schedule of hangers, supports, mechanical groove couplings, and earthquake bracing shall be shown on the sop and erection drawings, and shall include manufacturer’s number, type, size, rod size, etc.

PART 3 - EXECUTION

3.01 GENERAL

A. Position sprinkler heads at center of tile unless specifically indicated to the contrary on reflected ceiling plans.

B. Coordinate sprinkler piping routing with ductwork, pipes, structure, conduit, and other building components.

1. Provide auxiliary drains and pipe offsets required to clear other work.

2. Relocate sprinkler piping which has not been coordinated with other work at no cost to Owner.

C. Arrange, phase, and perform work to assure adequate services for the Owner at all times.

D. Run piping concealed above furred ceilings and in joists to minimize obstructions. Expose only heads as indicted on reflected ceiling plans.

E. Protect sprinkler heads against mechanical injury with standard guards.

F. Provide tamper switches for each sprinkler zone control valve and main entrance service valve. Connect switches to fire alarm system in accordance with Division 16.

G. Provide flow switches, UL approved, which close contact when flow is detected, in sprinkler lines where noted.

1. Install flow switches and adjacent valves to be easily accessible and behind access panels when located above plaster ceilings.

2. Locate flow switch minimum of 12 inches from a fitting that changes the direction of flow and not less than 24 inches from a drain connection or 10 pipe diameters from a gate, check, or alarm valve.

3. Connect switches to fire alarm system in accordance with Division 16.

H. Provide brace and clamp bends, plugs, tees, and installation in accordance with the requirements of NFPA Standard No. 24. Anchor connection between underground piping and base or riser with tie rods and pipe clamps.

I. Provide drains at base of risers, on valved sections, and at other locations for complete drainage of system. Drains may be valved and connected to central drain riser, or may spill outside over splash block, or into a floor drain capable of handling full flow of drain line.

J. Provide valved test pipes in accordance with NFPA Standard No. 13 and extend to discharge through proper orifice as specified above.

K. Flush system before connecting sprinkler to underground supply connection in accordance with requirements of NFPA Standard No. 13.

3.02 INSTRUCTIONS

A. Furnish the Architect with 1 bound copy of complete instructions, including catalog cuts, diagrams, Drawings, and other descriptive data covering the proper testing, operation, and maintenance of each type of system installed, and the necessary information for ordering replacement parts. In addition, post 1 copy of complete instructions at the alarm check valve location.

B. Provide Owner's maintenance personnel with detailed instructions covering the necessary and recommended testing, operating, and maintenance procedures for each type of system.

3.03 TESTS

A. Upon completion and prior to acceptance of the installation, subject the system, including the underground supply connection, to all tests per NFPA Standard No. 13 and furnish the Architect with a certificate thereof.

END OF SECTION

SECTION 15057 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.02 RELATED WORK OF OTHER SECTIONS

A. Division 0-Bidding & Contract Forms, and Division 1, General Requirements, govern the work of this section.

1.03 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.

2. Torque, speed, and horsepower requirements of the load.

3. Ratings and characteristics of supply circuit.

4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.01 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

C. Comply with IEEE 841 for severe-duty motors.

D. Comply with City and County adopted energy code for motor efficiency.

2.02 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet (1000 m) above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and

environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.03 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be permanent-split capacitor.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

END OF SECTION

SECTION 15058 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies basic requirements for electrical components, which are an integral part of packaged mechanical equipment and other mechanical systems equipment. These components include, but are not limited to factory installed motors, motor controllers and disconnect switches furnished as an integral part of packaged mechanical equipment or other mechanical systems equipment.

B. The work under Division 15 shall include the following items of related electrical work, unless noted otherwise:

1. Cooperating with the electrical-work Subcontractor in the proper connecting, adjusting, and placing into service all electrical equipment required for the mechanical work.

2. Providing and installing the appropriate electric motors for all motor-driven equipment in the mechanical work. These motors shall be specified as part of each item of equipment. The electrical wiring installation of the motor shall be part of the electrical work in Division 16.

3. Electrical devices with piping connections, excluding DDC devices provided by the controls contractor, shall be installed and wired as part of the mechanical work under Division 15.

4. Factory-wired motors and control panels for packaged equipment shall be as specified in Division 2 and shall be provided and installed under the mechanical work unless specifically noted otherwise. Control panels for packaged equipment shall be modified, if necessary, as part of the mechanical work to include the following safety features:

   a. Control panels that contain pneumatic, hydraulic, or other non-electrical parts requiring adjustment, maintenance, or repair shall be provided with a door interlock de-energizing all exposed, electrically live parts or wiring when the door is opened.

   b. Where control panels include non-electrical components requiring servicing by workmen other than qualified electricians, all terminals and wiring within the control panel shall be suitably protected to prevent injury to personnel and to prevent electrical contact with tools or material.

   c. All electric ladder-control diagrams for packaged equipment shall include terminal-strip designations showing as-built wiring. All electrical work includes providing power to all mechanical equipment requiring 120 or above voltage source under Division 26.

5. Control wiring for components of packaged equipment (such as boiler, deprecator, chemical treatment) shall be under Mechanical work as per manufacturer requirements.

6. Wiring between remote control panel and equipment, wiring between remote motor controller and motor shall be part of mechanical work under Division 23.

C. Specific electrical requirements (i.e. horsepower and electrical characteristics) for mechanical equipment are scheduled on the Drawings.

1.02 SUBMITTALS

A. Provide submittals in accordance with provisions of Division 1. No separate submittal is required. Submit product data for motors, starters, and other electrical components with submittal data required for the equipment for which it serves, as required by the individual equipment specification Sections.

B. Coordinate with electrical contractor all power wiring requirements.

1.03 QUALITY ASSURANCE

A. NEMA Standards MG I: Motors and Generators.

B. NEMA Standard ICS 2: Industrial Control Devices, Controllers, and Assemblies.

C. NEMA Standard 250: Enclosures for Electrical Equipment.

D. NEMA Standard KS 1: Enclosed Switches.

E. Comply with National Electrical Code (NFPA 70).

F. Comply with UL listing.

G. Comply with ANSI/IEEE 112.

PART 2 - PRODUCTS

2.01 MOTORS

A. Acceptable Manufacturers:

1. Baldor

2. General Electric

3. US Motors

4. Reliance

5. Lincoln

6. Westinghouse

B. General: The following are basic requirements for simple or common motors. For special motors, more detailed and specific requirements are specified in the individual equipment specifications.

C. Electric Motors:

1. All electric motors shall comply with requirements of NEMA, UL, ANSI/IEEE 112 and NEC, suitable for intended load, voltage, phase, frequency, service, and location.

2. Limit maximum motor speeds to 1750 rpm, unless otherwise specified.

3. Motors 1/2 HP and larger shall be 3 phase, 60 Hz, squirrel cage induction motors unless specifically specified to the contrary in subsequent Sections of this Division.

   a. Refer to Drawings for voltage requirements.

   b. Totally enclosed motors rated 3/4 HP, 1200 rpm, or 1 HP and larger, and all drip-proof motors shall have a 1.15 continuous-duty service factor at 40 degrees C ambient temperature.

   c. Insulation system shall be NEMA Class F or better.

   d. Provide double-shielded, grease-lubricated ball bearings with grease pockets on each side for regreasing in service.

   e. Provide inlet and outlet grease connections in 7.5 HP and larger motor housings for each bearing.

   f. Motors S HP and smaller and all roof-mounted equipment motors shall be provided with factory sealed, permanently lubricated ball bearings.

4. Motors smaller than 1/2 HP shall be single phase, 110-volt permanent split-capacitor type with integral thermal overload protection. Bearings shall be factory sealed, permanently lubricated ball type.

5. Provide totally enclosed motors, or suitable protection per NEMA Standards, in locations exposed to the weather or dripping water and in air handling units downstream of cooling coils and heat recovery coils. Other motors shall be open drip-proof.

6. Multispeed motors shall be provided where specifically scheduled.

7. Motors feed by variable frequency drives (VFD) shall be specifically designed by motor manufacturers for variable frequency drive application.

8. Minimum Efficiency and Power Factor: Minimum Power Factor shall be 85 percent minimum, in all sizes, and minimum efficiency shall be as

follows, for 1,750 rpm motors as tested in accordance with NEMA Table 1 2-6D. The minimum efficiencies shall be guaranteed.

Motor HP	Efficiency Percent
	85.5
1-1/2	86.5
2	86.5
3 and 5	89.5
7-l/2 and 10	91.0
5-20	92.4
25-30	93.6
40 and 50	94.1
60	94.5
75	95.0
100-125	95.4
150 and larger	95.8

9. Overload protection: Built-in thermal overload protection and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.

10. Noise rating: Comply with ANSI/NEMA MG 1.”Quiet” rating on motors located in occupied spaces of building.

11. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.

2.02 STARTERS, ELECTRICAL DEVICES, AND WIRING

A. Motor Starters:

1. Starters and control wires are provided under Division 23, and installed Under Division 26, unless furnished as an integral part of manufacturer’s packaged equipment. Responsibility for providing starter compatible with motor furnished rests with starter supplier, however, equipment supplier shall provide sufficient data with shop drawings and submittals to clearly indicate all motor starter requirements.

2. Furnish single-phase motors with manual motor starters having integral overload protection.

3. Furnish 3-phase motors with full voltage, magnetic across-the-line starters unless noted otherwise.

4. Provide thermal overload protection for all 3-phase legs. Provide motor starters with single-phase protection.

5. Provide fail-open auxiliary contacts, prewired to a terminal strip, for future remote alarm wiring and run-time totalization. Refer to Division 26.

6. Provide equipment starters with an adequate control transformer, complete with fuse protection, to supply 120-volt source for control circuit, regardless of line voltage.

7. Provide hand-off-automatic selector switches in cover.

8. Variable Frequency Drive Controllers: Provided under Section 23 73 13 Custom Central Air Handling Unit.

B. Manual switches shall have pilot lights and extra positions for multi-speed motors.

C. Overload protection: Melting alloy type thermal overload relays.

D. Magnetic Starters:

1. Maintained contact push buttons and pilot lights, properly arranged for single speed or multi-speed operation as indicated.

2. Trip-free thermal overload relays, each phase.

3. Interlocks, pneumatic switches, electric relays and similar devices as required for coordination with control requirements of Division 23 Controls Sections.

4. Externally operated manual reset.

5. Under-voltage release or protection.

E. Motor connections:

1. Flexible conduit, except where plug-in electrical cords are specifically indicated.

PART 3 – EXECUTION

Not Used

END OF SECTION

SECTION 15061 - HANGERS AND SUPPORTS FOR PLUMBING PIPING & EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section includes the following hangers and supports for plumbing system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Fiberglass pipe hangers.
4. Metal framing systems.
5. Fiberglass strut systems.
6. Thermal-hanger shield inserts.
7. Fastener systems.
8. Pipe stands.
9. Pipe positioning systems.
10. Equipment supports.

1.02 RELATED WORK OF OTHER SECTIONS

A. Division 0-Bidding & Contract Forms, and Division 1, General Requirements, govern the work of this section.

1.03 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.04 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.05 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.

2. Fiberglass pipe hangers.

3. Thermal-hanger shield inserts.

4. Powder-actuated fastener systems.

5. Pipe positioning systems.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.

2. Metal framing systems. Include Product Data for components.

3. Fiberglass strut systems. Include Product Data for components.

4. Pipe stands. Include Product Data for components.

5. Equipment supports.

C. Welding certificates.

1.06 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."

2. AWS D1.2, "Structural Welding Code--Aluminum."

3. AWS D1.4, "Structural Welding Code--Reinforcing Steel."

4. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:

1. AAA Technology & Specialties Co., Inc.
2. Anvil International; Gruvlok.
3. Bergen-Power Pipe Supports.
4. B-Line Systems, Inc.; a division of Cooper Industries.
5. Carpenter & Paterson, Inc.
6. Empire Industries, Inc.
7. ERICO/Michigan Hanger Co.
8. Globe Pipe Hanger Products, Inc.
9. GS Metals Corp.
10. National Pipe Hanger Corporation.
11. PHD Manufacturing, Inc.
12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.
14. Tolco Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.03 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.04 FIBERGLASS PIPE HANGERS

A. Clevis-Type, Fiberglass Pipe Hangers: Similar to MSS Type 1, steel pipe hanger except hanger is made of fiberglass and continuous-thread rod and nuts are made of polyurethane or stainless steel.

1. Manufacturers:

    a. B-Line Systems, Inc.; a division of Cooper Industries.

    b. Champion Fiberglass, Inc.

    c. Cope, T. J., Inc.; Tyco International, Ltd.

    d. Seasafe, Inc.

    e. Unistrut Corp.; Tyco International, Ltd.

    f. Wesanco, Inc.

B. Strap-Type, Fiberglass Pipe Hangers: Made of fiberglass loop with stainless-steel continuous-thread rod, nuts, and support hook.

1. Manufacturers:

    a. Plasti-Fab, Inc.

2.05 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.

2. ERICO/Michigan Hanger Co.; ERISTRUT Div.

3. GS Metals Corp.

4. Power-Strut Div.; Tyco International, Ltd.

5. Thomas & Betts Corporation.

6. Tolco Inc.

7. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.06 FIBERGLASS STRUT SYSTEMS

A. Description: Shop- or field-fabricated pipe-support assembly, similar to MFMA-3, made of fiberglass channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.

2. Champion Fiberglass, Inc.

3. Cope, T. J., Inc.; Tyco International Ltd.

4. Seasafe, Inc.

2.07 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- (690-kPa-) minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers:

1. Carpenter & Paterson, Inc.

2. ERICO/Michigan Hanger Co.

3. PHS Industries, Inc.

4. Pipe Shields, Inc.

5. Rilco Manufacturing Company, Inc.

6. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.08 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. Hilti, Inc.

b. ITW Ramset/Red Head.

c. Masterset Fastening Systems, Inc.

d. MKT Fastening, LLC.

e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.

b. Empire Industries, Inc.

c. Hilti, Inc.

d. ITW Ramset/Red Head.

e. MKT Fastening, LLC.

f. Powers Fasteners.

2.09 PIPE STAND FABRICATION

A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod-roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

1. Manufacturers:

a. ERICO/Michigan Hanger Co.

b. MIRO Industries.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

1. Manufacturers: MIRO Industries.

D. High-Type, Single-Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

1. Manufacturers:

a. ERICO/Michigan Hanger Co.

b. MIRO Industries.

c. Portable Pipe Hangers.

2. Base: Stainless steel.

3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.

4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

1. Manufacturers: Portable Pipe Hangers.

2. Bases: One or more plastic.

3. Vertical Members: Two or more protective-coated-steel channels.

4. Horizontal Member: Protective-coated-steel channel.

5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.

2.10 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, system of metal brackets, clips, and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.

B. Manufacturers:

1. C & S Mfg. Corp.

2. HOLDRITE Corp.; Hubbard Enterprises.

3. Samco Stamping, Inc.

2.11 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.12 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.

2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.01 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).

2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F (49 to 232 deg C) pipes, NPS 4 to NPS 16 (DN 100 to DN 400), requiring up to 4 inches (100 mm) of insulation.

3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN 20 to DN 600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.

4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24 (DN 15 to DN 600), if little or no insulation is required.

5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.

6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8 (DN 20 to DN 200).

7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).

8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).

9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2 (DN 15 to DN 50).

10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8 (DN 10 to DN 200).

11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3 (DN 10 to DN 80).

12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).

13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange.

15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.

16. Adjustable, Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36 (DN 65 to DN 900), if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.

17. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30 (DN 25 to DN 750), from 2 rods if longitudinal movement caused by expansion and contraction might occur.

18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20 (DN 65 to DN 500), from single rod if horizontal movement caused by expansion and contraction might occur.

19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42 (DN 50 to DN 1050), if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24 (DN 50 to DN 600), if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.

21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30 (DN 50 to DN 750), if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).

2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.

2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.

3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.

4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.

5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.

2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.

3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.

4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.

5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.

6. C-Clamps (MSS Type 23): For structural shapes.

7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.

8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.

9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.

10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.

11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.

12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb (340 kg).

    b. Medium (MSS Type 32): 1500 lb (680 kg).

    c. Heavy (MSS Type 33): 3000 lb (1360 kg).

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.

2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.

3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.

2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).

3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.

4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.

5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.

6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.

7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.

8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

   a. Horizontal (MSS Type 54): Mounted horizontally.

   b. Vertical (MSS Type 55): Mounted vertically.

   c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

O. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.02 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.

2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Fiberglass Pipe Hanger Installation: Comply with applicable portions of MSS SP-69 and MSS SP-89. Install hangers and attachments as required to properly support piping from building structure.

D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

E. Fiberglass Strut System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled fiberglass struts.

F. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

G. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

H. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb.

I. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer to Specification Section 15410 - Plumbing Piping for plumbing fixtures.

J. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

K. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

L. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

M. Install lateral bracing with pipe hangers and supports to prevent swaying.

N. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in

direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

O. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

P. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.

Q. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

   c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.

   b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.

   c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.

   d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.

   e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.

5. Pipes NPS 8 (DN 200) and Larger: Include wood inserts.

6. Insert Material: Length at least as long as protective shield.

7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.03 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.04 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedure for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.05 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

3.06 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION

SECTION 15062 - HANGERS & SUPPORTS FOR HVAC PIPING & EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes supports, anchors and seals.

B. This Section includes seismic bracing for Seismic Zone 1A.

1.02 QUALIFY ASSURANCE

A. Submit information as required by Division 1 for approval of seismic bracing, support and anchorage to the structure for equipment, conduits, piping and ductwork. System to be used for the project.

B. Suspended piping (medical, mechanical, plumbing), ductwork and equipment shall be attached to the structure, supported by, and seismically braced per the most current revision of one of the following:

1. Mason seismic Restraint Guidelines for suspended piping.

2. Unistrut seismic bracing system.

3. Tomarco ISAT Seismic Restraint system

4. SMACNA Seismic Restraint guidelines.

5. NUSIG Seismic Restraint guidelines.

C. Application of seismic bracing systems shall be as follows.

1. Designed, engineered and built by the system contractor. The details and seismic bracing shop drawings shall be reviewed and approved by Project Structural Engineer of Record before installation.

2. Select components for strut, strut clamps, strut fittings, strut nuts, hangers, pipe clamps etc., in accordance with the pre-engineered seismic bracing systems designed for seismic zone 2A that have been reviewed and approved by the Project Structural Engineer of Record.

3. Once a seismic bracing system is selected for the project and approved by the Structural Engineer of Record, the system shall be used for the entire project within a given mechanical system. Mixing of different seismic bracing systems is not permitted.

D. Do not mix seismic bracing designs within a given new system designs.

E. Fire protection piping supports and seismic bracing requirement, refer to Section 15051 common work results for fire suppression.

F. All conditions which involve thermal and/or building expansion and contraction shall be taken in consideration and identified in the coordinated shop drawings.

G. Seismic bracing, support and anchorage to the structure of all conditions which involve thermal and/or building expansion and contraction shall be engineered and built by the applicable system contractor. When applicable seismic bracing, support and anchorage details are used, review these details with Project Structural Engineer and Mechanical Engineer.

H. Contractor shall submit, prior to installation, seismic load calculations for equipment, conduits, piping and ductwork, anchorage details, seismic brace detail(s), seismic brace connection to system detail(s), seismic brace connection to structure detail(s) and seismic brace spacing or lay-out details.

1. Calculations required for supports and bracing for:

   a. Sizes and situations not covered by pre-engineered systems.

   b. Where layout differs from design for which calculations are prepared by Project Structural Engineer.

2. Include horizontal and vertical reaction loads at connections to building structures for all seismic restraints, including those covered by referenced Guidelines. Coordinate reaction loads and attachment details with Contracting Officer.

3. Calculations prepared and signed by a Structural Engineer knowledgeable in Seismic Design registered in Hawaii.

   a. Hired by Contractor under this Section.

   b. Cost of calculations borne under this Section.

I. All connections to the structure shall be sized according to actual applied load plus any seismic vertical component increase. Do not size connection to the structure according to threaded hanger rod size.

J. Contractor shall submit, prior to installation, data identifying the various supports to structure connections and seismic brace structure connections. Submittal data shall identify the following:

1. Location of connections.

2. Numerical identification of maximum allowable design value of connecting method.

3. Numerical value of applied load or reaction.

4. Type of connection (vertical support, vertical support with seismic brace).

5. Seismic brace reaction type (tension only, tension & compression).

6. Detailed thawing (listing all related components) of method of connections.

K. Submit letter signed by Structural Engineer performing seismic load calculations in conformance with paragraph entitled QUALITY ASSURANCE, confirming that:

1. Structural Engineer has performed calculations for each seismic restraint not covered by referenced Guidelines as part of this Contract.

2. Structural Engineer has performed calculations for reaction loads to the building structure for all seismic restraints, including those covered by referenced Guidelines.

3. Structural Engineer has coordinated his bracing layout, reaction loads and details of structural attachments with Contracting Officer.

4. Structural Engineer has confirmed that proposed system of seismic bracing is fully compatible with building structure.

5. Copy of calculations and layout drawings for seismic bracing to be maintained on jobsite.

L. Seismic bracing design force applications greater than those noted in the pre-engineered systems shall be engineered by the contractor and submitted prior to installation. These applications shall be reviewed and approved by the Project Structural Engineer of Record.

M. When the pre-engineered system details are not usable for a given project condition, it shall be resolved through engineered adaptations or alteration. Whenever possible these adaptations or alterations shall use the specified pre-engineered seismic bracing system components to maintain compliance and uniformity. In all cases, and prior to installation, these adaptations or alterations shall be engineered in accordance with standard engineering practices by a qualified, registered Structural Engineer, and shall be submitted to the Project Structural Engineer and Mechanical Engineer of Record for their review and preliminary approval.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Hangers:

1. In accordance with the selected pre-engineered seismic bracing system.

B. Strut - Channel Framing:

1. In accordance with the selected pre-engineered seismic bracing system.

C. Anchors - Drill In:

1. Pre-approved with ICBO tested load rating. All expansion anchors used on the project shall be from one Manufacturer.

2.02 SEISMIC RESTRAINTS

A. General

1. Capable of safely accepting indicated external forces without failure.

2. Maintain equipment, piping and ducts in a captive position.

B. Criteria: Design for seismic forces herein before specified.

C. Bracing System: One of the following methods as most applicable for each brace.

1. Complete system of factory fabricated components.

2. Complete system of job fabricated components.

3. Miscellaneous metal structural shapes.

2.03 ANCHORS, INSERTS AND FASTENERS

A. All anchors and inserts shall be installed according to the ICBO standards.

B. Do not use any anchor or insert in concrete which does not have a signed structural engineered design value based on its installed application.

C. Do not use powder driven and power driven (Shoot-In) fasteners, expansion nails or friction spring clips for Mechanical seismic bracing application.

D. An over-head concrete anchors or inserts shall be selected from listings within the specified pre-engineered seismic bracing systems and shall have maximum allowable design tension or shear values no greater than those listed within ICBO evaluation report.

E. All anchors, inserts or connections to the structure shall be submitted to the Structural Engineer of Record for approval. Submittal review and/or acceptance by the Mechanical or Electrical Engineer of Record shall not constitute compliance or usability.

F. Box type inserts which allow movements for horizontal adjustment shall not be allowed, unless engineered solution is provided to assure positive captive positioning and securing of load bearing attachment. Concrete inserts shall not be used for seismic bracing attachment unless specifically detailed in the Pre-Engineered Seismic Bracing Systems.

G. All combined tension and sheer anchor or insert attachments shall be engineered.

H. All unusable and/or non-compliance anchors or inserts, shall be cut-off flush with the concrete or removed at the contractors expense.

I. Job site torque and/or load or pull testing shall not be allowed as justification for use of non-compliance anchors or inserts.

J. Torque testing of anchors shall be allowed to verify compliance of anchor installation, however, torque testing shall not justify usability of anchor. Only load or pull testing shall be allowed to justify usability of anchors. Failure of torque shall constitute failure of anchor.

K. 50 percent of anchors installed in concrete shall be tested in alternate groups, upon failure of an anchor, the next 20 consecutive anchors must pass, before 50 percent alternate group testing can resume.

L. If anchor failures are due to contractor error, retesting of failed anchors as well as consecutive anchor testing to confirm contractors' ability to properly install anchors will be at the contractor's expense.

M. All items attached to or support from structural or immediate steel, shall have a positive assembly and shall be through bolted, welded or clamped to the steel. All clamps shall be constructed of malleable iron or steel and shall include a retaining strap or J-hook.

2.04 PIPE HANGERS AND SUPPORTS FOR NON-SEISMIC BRACING APPLICATION

A. Hangers for Uninsulated Steel or Copper Pipe, All Sizes: An adjustable wrought steel clevis plastic-coated for copper piping.

B. Hangers for Cold Insulated Steel or Copper Pipe, All Sizes (Except Steam Pipe 2-1/2 Inches and Larger): An adjustable wrought steel clevis, sized to suit 360 degree high-density insulation insert.

C. Hangers for Hot Insulated Steel or Copper Pipe, An Sizes, (except steam pipe 2-1/2 inches and larger): An adjustable wrought steel clevis, sized to suit a 180 degree, 20 gauge galvanized sheet metal insulation saddle, 12 inches long.

D. Hangers for Insulated Steel Steam Pipe, Sizes 2-1/2 inches and Larger: Adjustable roller hanger with steel yoke and cast iron roller, with welded insulation protection saddle, size to accommodate insulation.

E. High Density Insulation Inserts: For pipes 2-1/2 inches and larger use 360 degree calcium silicate (waterproofed for chilled water) inserts having a lap jointed 360 degree sheet metal protective sleeve. Thickness of insert shall match pipe covering (insulation) thickness. All inserts shall have an independent lab certified break, crack and/or crush strength equal to or greater than 5 times the applied load. Do not use inserts at seismic brace connection locations without prior written approval from the system design engineer. Do not connect seismic bracing to inserts without prior written approval from the system design engineer. Submit copies of insert manufacturer's independent lab test reports. Replace all cracked, damaged and/or non-compliance inserts at no additional cost to Owner.

F. Multiple or Trapeze Hangers: Steel channels or angles with welded spacers and hanger rods, sized to support load.

G. Wall Support for Pipe Sizes to 3 inches: Cast iron hooks.

H. Wall Support for Pipe, Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp; adjustable steel yoke and cast iron roil for hot pipe, sizes 5 inches and larger.

I. Vertical Support: Steel riser clamp.

J. Floor Support for Hot Pipe, Sizes to 4 inches, and all Cold Pipe Sizes: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.

K. Beam Clamps for pipe hangers shall be complete with safety straps.

L. Design hangers to impede disengagement by movement of supported pipe.

M. Provide plastic-coated hangers and supports for copper piping or provide isolator between hanger or support and piping.

N. Provide angles or channels to span joists and distribute load.

O. Do not use wire for either temporary or permanent hanger or support purposes.

2.05 PIPE HANGERS AND SUPPORTS FOR SEISMIC BRACING APPLICATION

A. Hangers for single hanger supported piping shall be steel clevis type.

B. Hangers shall be designed and installed to allow for a minimum 1-1/2 inches of vertical adjustment.

C. Hangers, supports and insulation for conditions which involve thermal and/or building expansion and contraction shall be engineered based on actual field conditions. Hangers shall be designed and installed to allow for vertical adjustment.

D. Trapeze supported piping shall be attached to minimum 12 gauge, 1-5/8 inch by 1-5/8 inch (strut) channel framing or a structurally engineered trapeze hanger support.

E. Items supported by trapeze hangers shall be properly attached at each trapeze location.

F. Hangers and vertical support rods shall be sized and spaced according to the pre-engineered seismic bracing systems.

G. Provide a protective barrier between non-compatible dissimilar metals.

H. High Density Insulation Inserts: shall not be used at piping seismic attachment locations unless shown otherwise in the OSFIPD pre-approved seismic bracing systems.

2.06 HANGER RODS

A. Provide steel hanger rods, appropriately threaded.

2.07 DUCT HANGERS AND SUPPORTS FOR NON-SEISMIC BRACING APPLICATIONS

A. In accordance with CMC and SMACNA Standards.

B. Provide galvanized steel angles, channels, straps, rods, etc., for duct support. Do not use raw steel.

2.08 DUCT HANGERS AND SUPPORTS FOR SEISMIC BRACING APPLICATION

A. In accordance with one of the pre-engineered seismic bracing systems.

2.09 FLASHING

A. Steel Flashing: 26 gauge galvanized steel.

B. Lead Flashing: 4 pound per square foot sheet lead for waterproofing; 1 pound per square foot sheet lead for soundproofing.

C. Safes: 5 pound per square foot sheet lead or 8 mil thick neoprene.

D. Caps: Steel, 22 gauge minimum, 16 gauge at fire-resistant structures.

2.10 SLEEVES

A. Sleeves for Pipes Passing Through Walls and Footings: Schedule 40 black steel pipe sleeve. For waterproof sleeves, use Thunderline Link-Seal or Calpico Sealing Linx.

B. All pipes and ducts passing through fire-rated walls and floors shall be UL listed fire-rated assemblies. Pipe insulation carried through the penetration shall comply with the UL system requirement, but shall not be less than required in Specification Section 15260 Piping Insulation.

C. Open voids and cavities occurring in pipe sleeves and ductwork passing through rated walls and floors shall be completely sealed with materials specified in the UL system listing.

D. Size sleeves large enough to allow for movement due to expansion and to provide for continuous insulation.

PART 3 - EXECUTION

3.01 INSERTS AND DRILL-IN ANCHORS

A. Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams wherever practicable.

B. Let inserts in position in advance of concrete work. Provide reinforcement rod in concrete for inserts carrying pipe over 4 inches in diameter or ducts over 60 inches wide.

C. Where concrete slabs form finished ceiling, finish inserts flush with slab surface.

D. Locate expansion shields in concrete beams a minimum of 6 inches above bottom of beam.

E. Do not use friction spring-type clips.

F. Use hangers which are vertically adjustable after piping is erected.

3.02 PIPE HANGERS AND SUPPORTS

A. Support horizontal steel and copper piping where pipes are not seismically braced per CMC.

B. Support piping joined with grooved couplings per coupling manufacturer's installation guidelines.

C. Where pipes are seismically braced, support and brace pipes in accordance with the specified pre-engineered seismic bracing systems.

D. Install hangers to provide minimum 1/2-inch clear space between finished covering and adjacent work.

E. Support piping within 12-inches at each change in direction, at ends of branches, at base and top of risers, pipes and drops, and wherever necessary to prevent sag, bending, or vibration, in addition to the above listed hanger spacing.

F. Use hangers which are vertically adjustable 1-1/2 inches minimum after piping is erected.

G. Support horizontal soil pipe on both sides of each joint, with 5-0" maximum spacing between hangers.

H. Support vertical piping at every other floor unless shown otherwise. Support vertical soil pipe at each floor at joint.

I. Where several pipes can be installed in parallel and at same elevation, provide multiple individual hangers or trapeze hangers. Trapeze hangers

shall not be used for supporting piping systems with different thermal expansion characteristics and/or slope requirements.

J. Where practical, support riser piping independently of connected horizontal piping.

K. Support nonmetallic piping with a sufficient number of hangers to prevent sagging and misalignment.

L. Provide supports and miscellaneous metal such as steel plates, brackets, metal framing, bolts, nuts and etc. Where exposed to weather material shall be hot dipped galvanized.

M. Vertical piping shall be supported top and bottom. Equipment shall not be used to support piping.

N. Provide miscellaneous steel members, beam, brackets, etc. for support of work in this Division, unless specifically included in other Division.

O. Use felt pad vibration isolators, Super Strut 716, Trisolators, in lieu of copper plating on steel hangers (copper piping).

P. Hanger rod sizes shall be as shown below:

Pipe Size	Rod Size	Pipe Size	Rod Size
1/2 - 2”	3/8”	8 - 12”	7/8”
2-1/2”- 3-1/2”	3/8”	14 - 16	1”
4”-5”	1/2”	18-30	1-1/4”
6”	1/2”		

Q. Hanger Spacing Schedule: Maximum hanger and support spacing for horizontal piping, on centers, shall not exceed the spacing listed below. In all cases, avoid concentrating hangers. Evenly distribute the load oft the structural framing system.

Type of Pipe	3/4" or Less	1-1/2"	2" or Larger
Steel Pipe	8'	10'	10'
Copper Tubing	8'	10'	10'
Cast Iron Soil Pipe			10'

R. Horizontal cast iron soil pipe shall have hangers on at least every other joint, but the distance between hangers shall not exceed 10-feet. Over 5-feet length section, hanger shall be provided at each side of joint. Hubless cast iron soil pipe shall be provided with additional hangers as required to prevent sagging. Additional hangers shall be used for seismic restraint.

S. Install hanger on insulated piping in a manner that does not damage insulation. Provide steel pipe saddles as required to protect pipe covering. Pipe hangers on insulated piping shall be installed on the outside of the insulation and not in contact with the pipe (except at seismic pipe bracing when required). The insulation shall be protected by an 18-gauge galvanized steel shield.

T. Miscellaneous hangers and supports, not detailed on or reference by contract document, shall be designed to support the combined weight of the pipe, fluid, and pipe insulation, and shall have a safety factor of at least five, based on the ultimate tensile strength of the material used. Calculation and sketches shall be submitted with signature and stamped by a licensed Hawaii Structural Engineer for submittal review.

3.03 DUCT HANGERS AND SUPPORTS

A. Where ducts are not seismically braced, use duct hangers, supports, and installation per SMACNA Standards.

B. Where ducts are seismically braced, use duct hangers, supports and installation in accordance with the selected pre-engineered seismic bracing systems.

C. Specific details shown on Drawings take precedence over SMACNA requirements.

3.04 PRIMING

A. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipes shafts and suspended ceiling spaces are not considered exposed.

3.05 FLASHING

A. Rash and counterflash where mechanical equipment passes through weather or waterproofed walls, floors, and roofs.

B. Flash vent and soil pipes with 24 inches x 24 inches sheet lead, minimum 8 inches above roof

C. Provide 12 inches minimum height curbs for roof-mounted mechanical equipment. Flash and counter flash with galvanized steel, soldered and waterproofed.

3.06 SLEEVES

A. Set sleeves in position in advance of concrete work. Provide suitable reinforcing around sleeves.

B. Where piping or ductwork passes through floor, ceiling or non fire-rated wall, close off space between pipe or duct and construction with noncombustible insulation. Provide tight-fitting metal caps on both sides and caulk.

C. Provide pipe sleeves for all mechanical piping.

D. Adequately sleeve pipe passing through concrete or masonry walls or concrete slabs to receive both pipe and insulation pertaining thereto.

E. Waterproof sleeves shall be Thunderline Link-Seal or Calpico Sealing Linx.

F. Install sleeves on pipes as they are being hung, ready for proper placement in wall as wall is being constructed.

G. Where sleeves have been inadvertently omitted in concrete floors, provide requisite pipe opening by using properly sized diamond core drills after coordination with Structural Engineer. Areas located below drilling operations shall be protected from possible damage.

3.07 SEISMIC RESTRAINTS

A. Install seismic restraints for pipes, flues, ducts and equipment in accordance with the above listed codes and guidelines.

B. Design and install restraints to prevent permanent displacement in any direction caused by lateral motion, overturning, or uplift.

C. Make no rigid connections between equipment, pipes and ducts and building structure that degrade noise and vibration isolation systems.

D. Coordinate seismic bracing requirements with other sections to result in:

1. Vertical pipe and duct restraints to coincide with and take place of required hangers.

2. Longitudinal pipe bracing to coincide with required pipe anchors.

3.08 SEISMIC BRACING INSTALLATION

A. Piping and Ductwork:

1. Install all bracing and restraints per referenced “Guidelines”.

2. Coordinate seismic bracing and restraints so that required thermal expansion provisions are not restricted.

3. Provide floor support and bracing of pipe connection risers to equipment.

4. Where seismic bracing and restraints are not required refer to Section 15062 Hangers and Supports for HVAC Piping and Equipment.

B. Flexibly Supported Piping and Ducts:

1. Install and locate restraints to allow normal operation of systems without transmitting vibrations to building structure.

2. Location of restraints: Per referenced “Guidelines” as specified hereinbefore.

3. Construction of Restraints: Steel cables, installed slack.

C. Rigidly Mounted Equipment:

1. Secure to floor as required to prevent horizontal motion and overtuning.

2. Secure to walls or other equipment to prevent overtuning.

a. Attach to elements capable of taking calculated loads.

b. Provide steel backing in walls as required to brace equipment and piping from wall.

3.09 FIELD QUALITY CONTROL

A. Inspection of bracing devices by manufacturer's representative of bracing devices.

B. Make all connections recommended by manufacturer's representative.

END OF SECTION

SECTION 15111 - GENERAL-DUTY VALVES FOR PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes valves and cocks normally required in all plumbing, hydronic, and steam systems. Specialty valves may be found in other Division 15 Sections.

1.02 SUBMITTALS

A. Comply with provisions of Division 01.

B. Submit detailed shop drawings in accordance with Division 01. Clearly indicate make, model, location, type, size, body and valve materials, rising or non-rising stem and pressure rating.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Gate, Glove, Angle and Check Valve Manufacturers:

1. Nibco
2. Milwaukee
3. Powell
4. Hammond
5. Stockham
6. Crane
7. Walworth
8. Jenkins
9. Lunkenheimer
10. Grinnell

B. Ball Valve Manufacturers:

1. Nibco
2. Jamesbury
3. Apollo
4. Worchester

5. Hammond
6. Milwaukee
7. Grinnell

C. Butterfly Valve Manufacturers:

1. Nibco
2. Keystone
3. Centerline
4. Crane
5. Hammond
6. Stockham
7. Milwaukee
8. Victaulic
9. Grinnell

D. Plug Valve Manufacturers:

1. Resun
2. Rockwell
3. Homestead
4. Walworth
5. Dezurik

E. Non-Slam Check Valve Manufacturers:

1. Nibco
2. Metraflex
3. Centerline
4. Victaulic
5. Grinnell

F. Strainer:

1. Armstrong
2. Metraflex

3. Walworth
4. Bailey
5. Watts

G. All valves of the same type shall be products of a single manufacturer. Refer to the following for additional requirement.

H. Strainer

1. Armstrong
2. Metraflex
3. Walworth
4. Bailey
5. Watts

I. All valves of the same type shall be products of a single manufacturer. Refer to the following sections for additional requirement.

1. Section 15181 Hydronic Piping.
2. Section 15900 HVAC Instrumentation and Controls
3. Section 15140 Domestic Water Piping.

J. Provide valves with manufacturer's name and pressure rating clearly marked on outside of body. Valve shall be designed for repacking with valve under full working pressure.

K. Packing and gasket materials shall be non-asbestos. Refer to piping Sections for specific valve model numbers.

L. Provide guided chain operator for valve 6" and larger installed 7 feet above floor.

M. The pressure/temperature rating of the valve shall not be less than the design criteria applicable to all components of the system.

N. Meters and Gauges: Ashcroft, Moeller, American, Palmer, Princo, Trerice, Weskler, and Taylor.

O. Filter Gauges: Dwyer.

P. Water Flow Meters: ONICON

2.02 VALVE CONNECTIONS

A. Provide valves compatible with adjoining piping pipe joints. Valve shall be the full size of the pipe in which they are installed.

B. Thread pipe sizes 2 inches and smaller.

C. Flange pipe sizes 2-1/2 inches and larger.

D. Screw to threaded adapters for copper tubing.

E. Valves for domestic water system shall be low lead type.

2.03 GATE VALVES

A. Type 101: Rated for 250 psi saturated steam, 500 psi WOG, ASTM A126 Class B cast iron body, bronze wedge and seats, 250 psi, ASME flanged ends, non-rising stem, bolted bonnet, renewable seat rings. Nibco # FL669.

B. Type 102: Rated for 125 psi saturated steam, 200 psi WOG, ASTM Al26, Class B cast iron body, bronze or bronze faced wedge and seats, 125 psi, ASME flanged ends, non-rising stem, bolted bonnet, renewable seat rings. Nibco # F-6l9.

C. Type 103: Rated for 200 psi saturated steam, 400 psi WOG, ASTM B61 bronze body, bronze wedges and monel or stainless steel seats, threaded ends, rising stem, union bonnet. Nibco #T-l54A.

D. Type 104: Rated for 150 psi, saturated steam, 300 psi WOG, ASTM B62 bronze body, bronze wedge, threaded ends, rising stem, union bonnet. Nibco #T-l35/S-135.

2.04 GLOBE VALVE

A. Type 201: Rated for 250 psi saturated steam, 500 psi WOG, ASTM A126 Class B cast iron body, bronze or bronze faced disc and seat, 250 psi ASME flanged ends, OS&Y, rising stem, bolted bonnet, renewable seat rings. Drill and tap bosses for connection of drains where shown. Nibco #F-768-B.

B. Type 202: Rated for 125 psi saturated steam, 200 psi WOG, ASTM A126 Class B cast iron body, bronze or bronze faced-disc (teflon or composition facing permitted) and seat, 125 psi ASME flanged ends, *OS&Y,* rising stem, bolted bonnet, renewable seat rings. Nibco #F-718-B.

C. Type 203: Rated for 200 psi saturated steam, 400 psi WOG, ASTM B61 bronze body, hardened stainless steel disc and seat, threaded ends, rising stem, union bonnet, renewable seat rings. Nibco #T-256-AP.

D. Type 204: Rated for 150 psi saturated steam, 300 psi, WOG, ASTM B62 bronze body, bronze or renewable composition or teflon disc, threaded ends, rising stem, union or screw in bonnet. Nibco #T-235.

2.05 ANGLE VALVES

A. Type 301: Rated for 250 psi saturated steam, 500 psi WOG, ASTM A126 Class B cast iron body, bronze or bronze faced disc and seat, 250 psi ASME

flanged ends, OS&Y, rising stem, bolted bonnet, renewable seat rings. Drill and tap bosses for connection of drains where shown. Stockholm # F-54I.

B. Type 302: Rated for 125 psi saturated steam, 200 psi WOG, ASTM A126 Class B cast iron body, bronze or bronze-faced disc (teflon or composition facing permitted) and seat, 125 psi ASME flanged ends, OS&Y, rising stem, bolted bonnet, renewable seat rings. Stockholm #G-515.

C. Type 303: Rated for 200 psi saturated steam, 400 psi WOG, ASTM B61 bronze body, hardened stainless steel disc and seat, threaded ends, rising stem, union bonnet, renewable seat rings. Stockholm # B-237.

D. Type 304: Rated for 125 psi saturated steam, 200 psi WOG, ASTM B62 bronze body, bronze or renewable composition or teflon disc, threaded ends, rising stem, union or screw-over bonnet. Nibco #F-311.

2.06 CHECK VALVES

A. Type 401: Rated for 250 psi saturated steam, 500 psi WOG, ASTM A300 cast iron body, bronze or bronze-faced disc and seat, 250 psi ASME flanged ends, bolted cover, swing-type, renewable disc and seat. Nibco #F-968-B.

B. Type 402: Rated for 125 psi saturated steam, 200 psi WOG, ASTM A307 cast iron body, bronze or bronze-face disc and seat, 125 psi ASME flanged ends, bolted cover, swing-type, renewable disc and seat. Nibco #F-918B.

C. Type 403: Rated for 200 psi saturated steam, 400 psi WOG, ASTM B61 bronze body, bronze disc, threaded, ends, swing-type. Nibco #T-453-B.

D. Type 404: Rated for 125 psi saturated steam, 200 psi WOG, ASTM B62 bronze body, bronze disc, threaded ends, swing-type. Nibco #T-4I3.

E. Type 406: Rated for 250 psi water, 200°F, ASTM A48 or A126 Class B cast iron body, bronze or stainless steel disc and spring, Buna-N seat, non-slam or silent spring-loaded flanged type. Nibco F-960.

2.07 BALL VALVE

A. Type 501: Rated for 150 psi at 365°F, 600 psi at 200°F, Type 316 stainless steel body, ball and stem; 3-piece body, full port, reinforced TFE seat, stem seal and thrust washer; end entry, threaded ends, one-fourth turn to open. Nibco-T/5-580-70.

B. Type 502: Rated for 150 psi at 365°F, 600 psi at 250°F, bronze body, 2-piece body, reinforced TFE seat, stem seal and thrust washer, end entry, threaded ends, one-fourth turn to open. NIBCO-T/S-580-70.

C. Type 503: Rated for 600 psig, WOG, bronze, threaded ends, Buna-N seats, packing and gasket. U.L. listed for L.P.G. service. Nibco #595Y.

D. Provide stem extension to allow 2 inches of pipe insulation without interfering with valve operation.

2.08 PLUG VALVE

A. Type 601: 175 psig lubricated plug valve, semi-steel body with two-bolt cover, combination lubricant screw and gun fitting, provided with tube or stick sealant, and operating wrench (with set screw), screwed ends. Rockwell No. 142, ACF No. R-1430, Homestead No. 601 (2- 3/4 inch), Homestead No. 611(1- 2 inch), Walwarth No. 1796, or equal.

B. Type 602: 200 psig lubricated plug valve, semi-steel body, bolted gland type, flanged body, Rockwell No. 143, ACF No. R-1430, Homestead No. 612.

2.09 BUTTERFLY VALVE

A. Butterfly Valves: May be used in lieu of gate valves in chilled and heat recovery water service except for direct buried pipe. Provide stem extension to allow 2 inches of pipe insulation without interfering with valve operation.

1. 2 -1/2 inches and larger: MSS-SP 67, flange lug type (for end of line service) or grooved end rated 200 psi working pressure at 200°F.

2. Body: Cast iron, ASTM A 126, Class B. Malleable iron, ASTM A47 electroplated, or ductile iron, ASTM A536, Grade 65-45-12 electro-plated.

3. Trim: Bronze, aluminum bronze, or 300 series stainless steel disc, bronze bearings, one piece 316 stainless steel shaft and manufacturer's recommended resilient seat. Resilient seat shall be field replaceable, and fully line the body to completely isolate the body from the product. A phosphate coated steel shaft or stem is acceptable, if the stem is completely isolated from the product. Stem is acceptable, if the stem is completely isolated from the product.

4. Actuators: Field interchangeable. Valves for balancing service shall have adjustable memory stop to limit open position.

5. 6 inches and smaller: Lever actuator with minimum of seven locking positions, except where chain wheel is required.

6. 8 inches and larger: Enclosed worm gear with handwheel, and where required, chain-wheel operator.

B. Manufacturer: Nibco LD-2000.

2.10 STRAINER

A. Basket or Y Type. Tee type is acceptable for water service.

B. All Other Services: Rated 125 psi minimum saturated steam.

1. 2-1/2 inches and larger: Ranged, iron body. Armstrong model A8FL-125, or equal.

2. 2 inches and smaller: Cast iron or bronze. Armstrong model CA15C-l25, or equal.

3. Screens: Bronze, monel metal or 304 stainless steel, free area not less than 2 times pipe area, with perforations as follows:

   a. 3 inches and smaller: 0.045 inch diameter perforations for liquids.

   b. 4 inches and larger: 0.125 inch diameter perforations for liquids.

2.11 BALANCING VALVE

A. Circuit Setter Valve: A dual purpose flow balancing valve and adjustable flow meter, with bronze or cast iron body, calibrated position pointer, valved pressure taps or quick disconnects with integral check valves and preformed polyurethane insulating enclosure. Provide a readout kit including flow meter, readout probes, hoses, flow charts or calculator, and carrying case. Bell & Gossett # Circuit Setter, Taco, or equal.

B. Water flow Balancing Valves: For flow regulation and shut-off. Valves shall be line size rather than reduced to control valve size and be one of the following types:

   1. Butterfly valve as specified herein with memory stop.

   2. Eccentric plug valve: Iron body, bronze or nickel-plated iron plug, bronze bearings, adjustable memory stop, operating lever, rated 125 psi and 250°F.

2.12 TRIPLE DUTY VALVE:

A. Contractors option for use at pump discharge in lieu of check valve and balancing shut-off valve. Triple duty valve is a non-slam check valve with spring-loaded weighted disc and a calibrated adjustment feature permitting regulation of pump discharge flow and shut-off. Valves shall be designed to permit repacking under full line pressure. Unit shall be installed on discharge side of pump in a horizontal or vertical position with the stem up. Unit shall be cast iron body construction suitable for maximum working pressure of 175 psi and maximum operating temperature of 300°F, bronze disc and seat, stainless steel stem and spring. Bell & Gossett or Taco.

2.13 REDUCED PRESSURE BACKFLOW PREVENTER ASSEMBLY

A. Sizes 2-1/2” and larger:

   1. Assembly shall consist of two independently operating, spring loaded, wye pattern check valves and one hydraulically dependent differential relief valve, ductile material with epoxy coating, bronze trim and stainless steel check assemblies, 175 psi working pressure.

2. Relief valve shall be modular for ease of maintenance. The assembly shall be constructed so that all internal parts including seat rings can be serviced from the top or side or removed while assembly is in line.

3. Shut off valves shall be non-rising stem, outside stem and yoke, resilient gate valves. Test cocks shall be ball valves.

4. FEBCO model 825YD, or equal.

B. Sizes 2” and smaller:

1. Assembly shall consist of two independently operating, spring loaded, check valves and one hydraulically dependent differential relief valve. All bronze material, 175 psi working pressure.

2. Relief valve shall be removable seat ring. Check valve and relief valve maybe serviced without removing the valve body to the line. Shut off valves and test cocks shall be ported ball valves.

3. Manufacturer: FEBCO model 860, or equal.

2.14 PRESSURE RELIEF/SUSTAINING VALVE

A. Bronze body, ASTM 62, pressure class 225, Type 303 SS trim, Buna-N rubber disc, nylon reinforced Buna-N rubber diaphragm, stainless steel stem, nut and spring, vertical or straight through design.

B. 20 to 200 psi adjustment range unless otherwise noted.

C. Manufacturer: CLA-VAL# 50-01 or Muesco Series 116.

2.15 AIR VENTS

A. Provide and install manual air vents, Crane 88, Lunkenheimer 906-BS, or equal, in all hot water heating, and heat recovery, condenser water and chilled-water cooling systems at locations shown on drawings, at all high points, and other points necessary to free the piping system of air. The air vent assemblies shall consist of 1/4-inch copper tubing connected to the top of the high point, or other location, and extended down to easily accessible 1/4-inch globe valves mounted, grouped and tagged, approximately 5 feet above the floor. The valves shall individually discharge through 1/4-inch copper tubing to nearest floor drain, hopper drain, or to the outside, if drain line routing is not shown on the drawings.

B. Use 2-inch, automatic-type air vent valves only where specifically shown on the drawings; Hoffman, Armstrong 1-AV, or equal. The automatic valves shall be installed on a short, 3/4” inch minimum, riser with globe valve in riser. A full-sized copper tubing drain line shall be provided from the automatic valve to the nearest floor drain, hooper drain, or to the outside if drain line routing is not shown on the drawings.

2.16 GAUGE COCKS

A. Provide a gauge cock at each gauge connection to service main. Provide additional gauge cock at each gauge installed on gauge board. Gaugecocks shall be as specified in Section 15126 - Meters and Gauges for HVAC Piping.

2.17 WATER FLOW MEASURING DEVICE

A. Water flow measuring device/sensors for BI-directional flow measurement shall be single or dual Turbine type meters. All welded parts shall be 316 stainless steel. Meters on water lines larger than 6" or where turbulence flow occurs shall be Dual Turbine type. Flow meter shall be providing a 4 to 20 MA and a 0 to 10 VDC signal to the DDC system for non-chilled water application. Chilled water application shall be pulsating type completed with matching temperature sensors and BTU meter as specified under Section 15900 HVAC Instrumentation and Controls. System power requirement shall be 24VDC. Accuracy shall be 2% of reading over the middle of the operating range. Turn down shall be 50 to 1, operating temperature shall be 200^{O}F (220^{O} peak). On lines larger than 2", furnish a hot tap installation kit (branch outlet fitting, close coupled nipple and full ported ball valve, the sensor shall be hand-insertable in system pressure up to 400 psig. Turbine type flow meter shall be ONICON Model FB 1200 or equal.

2.18 PRESSURE GAUGE TAPS

A. Provide brass needle or gate valve, plug or ball valve (gauge cocks).

2.19 PRESSURE TEMPERATURE TAPS

A. Provide pressure or temperature test plugs. Taps shall be Pete's Plug, 1/2 inch NPT, brass with Nordel core, Model 710. In addition, the Contractor shall supply the Owner with six 5-inch stem pocked testing thermometers: Four 25-120 degrees F and Two 1-220 degrees F.

2.20 STEM-TYPE THERMOMETERS

A. Nine-inch scale adjustable angle, 2 degrees F scale division, red appearing mercury, lens front tube, cast aluminum case, brass separable socket or flange with perforated stem, and 2-1/2-inch extension necks on insulated piping.

B. Thermometers shall be installed as shown on the Drawings. Thermometer wells only shall be installed in like manner. All thermometer wells shall be constructed of brass or stainless steel and where installed in insulated piping shall have at least 2-1/2-inch lagging extension. Pressure temperature ratings of each well shall be suitable for the system in which it is installed. All wells shall be complete with caps and chains. Thermometers and thermometer wells shall have the following insertion lengths:

1. Located in Horizontal Piping and Vertical Piping below 6'- 0":

    a. 4-inch and 5-inch Pipe

2-1/2 inches

b. 6-inch and 8-inch Pipe

5 inches

2. Locate in Vertical Piping above 6'- 0":

a. 3-inch, 4-inch and 6-inch Pipe

5 inches

b. 8-inch and 10-inch Pipe

8 inches

C. Scale ranges may be slightly greater than shown to meet manufacturer's standard. Require ranges in degrees F:

Chilled water:	0 - 100
Hot Water	0 - 200

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide valves with stems upright or horizontal. Valve stem position must be arranged to allow access for maintenance. No valve shall be installed with stem pointing down.

B. Provide gate, ball, or butterfly valves for shutoff service and isolating service, and to isolate equipment, part of systems, and vertical risers, except in steam and condensate return piping systems.

C. Provide ball or lubricated plug valves for throttling service, and in control device or water meter bypasses.

D. Provide vertical check valves where applicable in discharge of chilled water, condenser water, heating water, and domestic water pumps.

E. Provide horizontal check valves where vertical check valves are not compatible with piping arrangements.

F. Do not use horizontal check valves in vertical applications.

G. Provide gas cocks for gas service.

H. Provide plug cocks in water systems for throttling service. Use non-lubricating plug cocks only when shutoff or isolating valves are also provided.

I. Provide drain valves at main shutoff valves and low points of piping and apparatus.

3.02 VALVE APPUCATION

A. Chilled and Reheat Water:

1. 2-1/2" and smaller:	Ball Valve:	Type 502
	Balancing Valve:	Circuit Setter
	Check Valve:	Type 404
2. 3" and larger:	Butterfly Valve	
	Balancing Valve:	Circuit Setter
	Check Valve:	Type 406

B. Domestic Cold and Hot Water System:

1. 2-1/2" and smaller:	Ball Valve:	Type 501
	Balancing Valve:	Circuit Setter
	Check Valve:	Type 406 (2" & smaller-Type 404)
2. 3" and larger:	Butterfly Valve	
	Balancing Valve:	Circuit Setter
	Check Valve:	Type 406

END OF SECTION

SECTION 15126 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Section Includes:

1. Thermometers.
2. Gages.
3. Test plugs.

1.02 RELATED WORK OF OTHER SECTIONS

A. Division 0-Bidding & Contract Forms, and Division 1, General Requirements, govern the work of this section.

1.03 DEFINITIONS

A. CR: Chlorosulfonated polyethylene synthetic rubber.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated; include performance curves.

B. Shop Drawings: Schedule for thermometers and gages indicating manufacturer's number, scale range, and location for each.

C. Product Certificates: For each type of thermometer and gage, signed by product manufacturer.

PART 2 - PRODUCTS

2.01 METAL-CASE, LIQUID-IN-GLASS THERMOMETERS

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

1. Palmer - Wahl Instruments Inc.
2. Trerice, H. O. Co.
3. Weiss Instruments, Inc.
4. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Case: Die-cast aluminum or brass, 7 inches (178 mm) long.

C. Tube: Red or blue reading, organic-liquid filled, with magnifying lens.

D. Tube Background: Satin-faced, nonreflective aluminum with permanently etched scale markings.

E. Window: Glass.

F. Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device.

G. Stem: Copper-plated steel, aluminum, or brass for thermowell installation and of length to suit installation.

H. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.02 THERMOWELLS

A. Manufacturers: Same as manufacturer of thermometer being used.

B. Description: Pressure-tight, socket-type metal fitting made for insertion into piping and of type, diameter, and length required to hold thermometer.

2.03 PRESSURE GAGES

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

1. AMETEK, Inc.; U.S. Gauge Div.

2. Ashcroft Commercial Instrument Operations; Dresser Industries; Instrument Div.

3. Ernst Gage Co.

4. Palmer - Wahl Instruments Inc.

5. Trerice, H. O. Co.

6. Weiss Instruments, Inc.

7. Weksler Instruments Operating Unit; Dresser Industries; Instrument Div.

B. Direct-Mounting, Dial-Type Pressure Gages: Indicating-dial type complying with ASME B40.100.

1. Case: Dry type, drawn steel or cast aluminum, 4-1/2-inch (114-mm) diameter.

2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.

3. Pressure Connection: Brass, NPS 1/4 (DN 8), bottom-outlet type unless back-outlet type is indicated.

4. Movement: Mechanical, with link to pressure element and connection to pointer.

5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.

6. Pointer: Red or other dark-color metal.

7. Window: Glass or plastic.

8. Ring: Stainless steel.

9. Accuracy: Grade A, plus or minus 1 percent of middle half scale.

10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure (100 kPa of vacuum to 103 kPa of pressure).

11. Range for Fluids under Pressure: Two times operating pressure.

C. Pressure-Gage Fittings:

1. Valves: NPS 1/4 (DN 8) brass or stainless-steel needle type.

2. Snubbers: ASME B40.5, NPS 1/4 (DN 8) brass bushing with corrosion-resistant, porous-metal disc of material suitable for system fluid and working pressure.

2.04 TEST PLUGS

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

1. Flow Design, Inc.

2. MG Piping Products Co.

3. National Meter, Inc.

4. Peterson Equipment Co., Inc.

5. Sisco Manufacturing Co.

6. Trerice, H. O. Co.

7. Watts Industries, Inc.; Water Products Div.

B. Description: Corrosion-resistant brass or stainless-steel body with core inserts and gasketed and threaded cap, with extended stem for units to be installed in insulated piping.

C. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F (3450 kPa at 93 deg C).

D. Core Inserts: One or two self-sealing rubber valves.

1. Insert material for water service at 20 to 200 deg F (minus 7 to plus 93 deg C) shall be CR.

2. Insert material for water service at minus 30 to plus 275 deg F (minus 35 to plus 136 deg C) shall be EPDM.

PART 3 - EXECUTION

3.01 THERMOMETER APPLICATIONS

A. Install liquid-in-glass thermometers in the outlet of each domestic, hot-water storage tank.

B. Provide the following temperature ranges for thermometers:

1. Domestic Hot Water: 30 to 180 deg F, with 2-degree scale divisions (Minus 1 to plus 82 deg C, with 1-degree scale divisions).

2. Domestic Cold Water: 0 to 100 deg F, with 2-degree scale divisions (Minus 18 to plus 38 deg C, with 1-degree scale divisions).

3.02 GAGE APPLICATIONS

A. Install dry-case-type pressure gages for discharge of each pressure-reducing valve.

B. Install dry-case-type pressure gages at suction and discharge of each pump.

3.03 INSTALLATIONS

A. Install direct-mounting thermometers and adjust vertical and tilted positions.

B. Install thermowells with socket extending one-third of diameter of pipe and in vertical position in piping tees where thermometers are indicated.

C. Install direct-mounting pressure gages in piping tees with pressure gage located on pipe at most readable position.

D. Install needle-valve and snubber fitting in piping for each pressure gage.

E. Install test plugs in tees in piping.

F. Install permanent indicators on walls or brackets in accessible and readable positions.

G. Install connection fittings for attachment to portable indicators in accessible locations.

H. Install thermometers and gages adjacent to machines and equipment to allow service and maintenance for thermometers, gages, machines, and equipment.

I. Adjust faces of thermometers and gages to proper angle for best visibility.

END OF SECTION

SECTION 15127 – METERS AND GAUGES FOR HVAC PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes water flow measuring devices flow meters, pressure gauges and pressure gauge taps, thermometers and thermometer wells, static pressure and filter gauges.

1.02 SUBMITTALS

A. Comply with provisions of Division 01.

B. Submit with shop drawings which indicate use, operating range, total range and location.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Meters and Gauges: Ashcroft, Moeller, American, Palmer, Princo, Trerice, Weskler, and Taylor.

B. Filter Gauges: Dwyer.

C. Water Flow Meters: ONICON

2.02 PRESSURE GAUGE TAPS

A. Provide brass needle or gate valve, plug or ball valve (gauge cocks).

2.03 PRESSURE TEMPERATURE TAPS

A. Provide pressure or temperature test plugs. Taps shall be Pete's Plug, 1/2 inch NPT, brass with Nordel core, Model 710. In addition, the Contractor shall supply the Owner with six 5-inch stem pocked testing thermometers: Four 25-120 degrees F and Two 1-220 degrees F.

2.04 STEM-TYPE THERMOMETERS

A. Nine-inch scale adjustable angle, 2 degrees F scale division, red appearing mercury, lens front tube, cast aluminum case, brass separable socket or flange with perforated stem, and 2-1/2-inch extension necks on insulated piping.

B. Thermometers shall be installed as shown on the Drawings. Thermometer wells only shall be installed in like manner. All thermometer wells shall be constructed of brass or stainless steel and where installed in insulated piping shall have at least 2-1/2-inch lagging extension. Pressure temperature ratings of each well shall be suitable for the system in which it is installed. All wells

shall be complete with caps and chains. Thermometers and thermometer wells shall have the following insertion lengths:

1. Located in Horizontal Piping and Vertical Piping below 6'- 0":

   a. 4-inch and 5-inch Pipe

      2-1/2 inches

   b. 6-inch and 8-inch Pipe

      5 inches

2. Locate in Vertical Piping above 6'- 0":

   a. 3-inch, 4-inch and 6-inch Pipe

      5 inches

   b. 8-inch and 10-inch Pipe

      8 inches

C. Scale ranges may be slightly greater than shown to meet manufacturer's standard. Require ranges in degrees F:

Chilled water:	0 - 100
Heat recovery	0 - 100

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install flow meters according to manufacturer's installation instructions. Allow minimum 10 pipe diameters upstream of metering station and 5 pipe diameters downstream.

B. Provide 1 pressure gauge per pump installing taps before strainers and on suction and discharge of pump. Pipe to gauge.

C. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer wells.

D. Apply thermal grease in thermowells prior to installation of thermometers.

3.02 APPLICATION

A. Flow Metering Stations: Chilled water systems where shown.

B. Pressure Gauge Taps: Coils inlet and outlet

C. Stem-Type Thermometers:

1. Cooling, heat recovery and heating coils inlet and outlet.
2. Boilers inlet and outlet.

D. Pressure/Temperature Taps:

1. All automatic control valves inlet and outlet.
2. Cooling heat recovery and heating coils inlets and outlet.

END OF SECTION

SECTION 15140 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes domestic water piping.

B. Water meters will be furnished by utility company for installation by Contractor.

1.02 RELATED WORK OF OTHER SECTIONS

A. Division 0-Bidding & Contract Forms, and Division 1, General Requirements, govern the work of this section.

1.03 DEFINITIONS

A. CPVC: Chlorinated polyvinyl chloride plastic.

B. PEX: Crosslinked polyethylene plastic.

C. PVC: Polyvinyl chloride plastic.

1.04 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing domestic water piping systems with 125 psig (860 kPa), unless otherwise indicated.

1.05 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings and water meters.

B. Water Samples: Specified in Part 3 "Cleaning" Article.

C. Field quality-control test reports.

1.06 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for potable domestic water piping and components.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

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

2.02 PIPING MATERIALS

A. Refer to Part 3 "Pipe and Fitting Applications" Article for applications of pipe, tube, fitting, and joining materials.

B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.03 COPPER TUBE AND FITTINGS

A. Soft Copper Tube: ASTM B 88, Types K and L (ASTM B 88M, Types A and B), water tube, annealed temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.

3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

B. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B), water tube, drawn temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought- copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.

3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

4. Copper, Grooved-End Fittings: ASTM B 75 (ASTM B 75M) copper tube or ASTM B 584 bronze castings.

a. Grooved-End-Tube Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, gasket suitable for hot water, and bolts and nuts.

2.04 VALVES

A. Bronze and cast-iron, general-duty valves are specified in Specification Section 15126 Meters and Gages for Plumbing Piping.

B. Balancing and drain valves are specified in Section 15126 Meters and Gages for Plumbing Piping.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Excavating, trenching, and backfilling are specified in Specification Division 2.

3.02 PIPE AND FITTING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground piping, unless otherwise indicated.

C. Grooved joints may be used on aboveground grooved-end piping.

D. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

E. Aboveground Domestic Water Piping: Use any of the following piping materials for each size range:

1. NPS 1 (DN 25) and Smaller: Hard copper tube, Type L (Type B); copper pressure fittings; and soldered joints.

2. NPS 1-1/4 and NPS 1-1/2 (DN 32 and DN 40): Hard copper tube, Type L (Type B); copper pressure fittings; and soldered joints.

3. NPS 2 (DN 50): Hard copper tube, Type L (Type B); copper pressure fittings; and soldered joints.

4. NPS 2 (DN 50): Hard copper tube, Type L (Type B) with grooved ends; copper grooved-end fittings; grooved-end-tube couplings; and grooved joints.

5. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): Hard copper tube, Type L (Type B); copper pressure fittings; and soldered joints.

6. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): Hard copper tube, Type L (Type B) with grooved ends; copper grooved-end fittings; grooved-end-tube couplings; and grooved joints.

7. NPS 4 to NPS 6 (DN 100 to DN 150): Steel pipe; gray-iron, threaded fittings; and threaded joints.

8. NPS 4 to NPS 6 (DN 100 to DN 150): Steel pipe with grooved ends; steel-piping, grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

9. NPS 4 to NPS 6 (DN 100 to DN 150): Hard copper tube, Type L (Type B); copper pressure fittings; and soldered joints.

10. NPS 8 (DN 200): Steel pipe; gray-iron, threaded fittings; and threaded joints.

11. NPS 8 (DN 200): Steel pipe with grooved ends; steel-piping, grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

12. NPS 10 and NPS 12 (DN 250 and DN 300): Steel pipe; gray-iron, threaded fittings; and threaded joints.

13. NPS 10 and NPS 12 (DN 250 and DN 300): Steel pipe with grooved ends; steel-piping, grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

3.03 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use bronze ball or gate valves for piping NPS 2 (DN 50) and smaller. Use cast-iron butterfly or gate valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.

2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 (DN 50) and smaller. Use cast-iron butterfly valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.

3. Hot-Water-Piping, Balancing Duty: Calibrated balancing valves.

4. Drain Duty: Hose-end drain valves.

B. Cast-iron, grooved-end valves may be used with grooved-end piping.

C. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 (DN 50) and smaller. Use butterfly or gate valves for piping NPS 2-1/2 (DN 65) and larger.

D. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping.

1. Install hose-end drain valves at low points in water mains, risers, and branches.

2. Install stop-and-waste drain valves where indicated.

E. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 2 (DN 50) and smaller and butterfly valves for piping NPS 2-1/2 (DN 65) and larger.

F. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow. Calibrated balancing valves are specified in Specification.

3.04 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Specification Section 23 05 00 "Common Work Results for HVAC and Plumbing."

B. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Wall penetration systems are specified in Specification Section 15050 Basic Mechanical Materials and Methods.

C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Pressure gages are specified in Specification Section "Meters and Gages for Piping," and drain valves and strainers are specified in Specification Section 15126 Meters and Gages for Plumbing Piping.

D. Install water-pressure regulators downstream from shutoff valves.

E. Install domestic water piping level without pitch and plumb.

3.05 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Specification 15050 Basic Mechanical Materials and Methods.

B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

C. Grooved Joints: Assemble joints with grooved-end-pipe or grooved-end-tube coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

3.06 HANGER AND SUPPORT INSTALLATION

A. Pipe hanger and support devices are specified in Specification Section 15061 Hangers and Supports for Plumbing Piping and Equipment. Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.

2. Individual, Straight, Horizontal Piping Runs: According to the following:

   a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.

   b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.

   c. Longer Than 100 Feet (30 m): MSS Type 49, spring cushion rolls, if indicated.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Install supports according to Specification Section 15061 Hangers and Supports for Plumbing Piping and Equipment.

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch (10 mm).

F. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 (DN 32) and Smaller: 84 inches (2100 mm) with 3/8-inch (10-mm) rod.

2. NPS 1-1/2 (DN 40): 108 inches (2700 mm) with 3/8-inch (10-mm) rod.

3. NPS 2 (DN 50): 10 feet (3 m) with 3/8-inch (10-mm) rod.

4. NPS 2-1/2 (DN 65): 11 feet (3.4 m) with 1/2-inch (13-mm) rod.

5. NPS 3 and NPS 3-1/2 (DN 80 and DN 90): 12 feet (3.7 m) with 1/2-inch (13-mm) rod.

6. NPS 4 and NPS 5 (DN 100 and DN 125): 12 feet (3.7 m) with 5/8-inch (16-mm) rod.

7. NPS 6 (DN 150): 12 feet (3.7 m) with 3/4-inch (19-mm) rod.

8. NPS 8 to NPS 12 (DN 200 to DN 300): 12 feet (3.7 m) with 7/8-inch (22-mm) rod.

G. Install supports for vertical steel piping every 15 feet (4.5 m).

H. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.

2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.

3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.

4. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.

5. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.

6. NPS 6 (DN 150): 10 feet (3 m) with 5/8-inch (16-mm) rod.

7. NPS 8 (DN 200): 10 feet (3 m) with 3/4-inch (19-mm) rod.

I. Install supports for vertical copper tubing every 10 feet (3 m).

J. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.08 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve, and extend and connect to the following:

1. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Specification Section 15410 Plumbing Fixtures.

2. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

3.09 FIELD QUALITY CONTROL

A. Inspect domestic water piping as follows:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

   a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

   b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test domestic water piping as follows:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.

2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.

4. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.

6. Prepare reports for tests and required corrective action.

3.10 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.

2. Open shutoff valves to fully open position.

3. Open throttling valves to proper setting.

4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

   a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.

   b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.

6. Remove and clean strainer screens. Close drain valves and replace drain plugs.

7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.

8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

A. Clean and disinfect potable and non-potable domestic water piping as follows:

1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.

2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:

   a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

   b. Fill and isolate system according to either of the following:

      1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.

2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION

SECTION 15150 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes components required to provide complete and working plumbing systems, including all appropriate connections for the utilities.

1.02 SUBMITTALS

A. Comply with provisions of Division 1.

B. Catalog Data including manufacturer's literature and illustrations.

C. Manufacturer's Specifications and Engineering Data.

D. Shop Drawings:

1. Dimensions.
2. Plumbing Diagrams.
3. Installation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Drains, Cleanouts, Shock Arresters, Grease Traps:

1. Josam
2. J.R. Smith
3. Wade
4. Zurn

B. Hose Bibbs:

1. Josam
2. JR. Smith
3. Wade
4. Zurn
5. Woodford

C. Dielectric Unions:

1. Eclipse, Inc.
2. Perfection Corp.
3. Watts Regulator Co.

2.02 FLOOR DRAINS

A. Refer to schedules on drawing.

B. Accessories: Provide cast iron trap for each drain and flashing clamping devices for drains located above rooms.

2.03 TRAP PRIMERS

A. Trap Primers: PPP inc., Sloan, or Zurn all bronze units with vacuum breaker and strainer. Provide access panel with Allen wrench lock for trap primers installed behind walls or above hard ceilings. Provide electronic automatic trap primers where water supply is on dead-end runs that do not serve flush valves. Refer to Section 23 05 00 - Common Work Results for HVAC And Plumbing.

2.05 CLEANOUTS

A. Wall Cleanouts: Zurn Z- 1445-1 no hub, with round stainless steel access cover, secured with vandal-proof screws. Match pipe size, 4 inches maximum.

B. Floor Cleanouts: Zurn Z- 1400-2, with field adjustable round scoriated nickel bronze cover, secured with vandal-proof screws. Match pipe size, 4 inches maximum.

C. Outside Grade Cleanouts: Zurn Z- 1405-7 with bronze countersunk cleanout plug. Match pipe size, 4 inches maximum.

2.06 SHOCK ARRESTERS

A. Shock Arresters: Piston-type water hammer arresters, properly sized and selected per P.D.I. Standard WH2O1 and having sufficient displacement volume to dissipate the calculated kinetic energy generated by the piping system.

1. Construct unit casing of copper.
2. Piston shall be acetol (NSF listed) or brass.
3. O-rings shall be Buna nitrile (FDA approved).
4. Solder shall be lead free.

B. Installation: Install units in all domestic hot and cold water piping branch lines serving plumbing fixtures.

PART 3 – EXECUTION

3.01 INSTALLATION

A. General:

1. Install in strict accordance with manufacturer’s instructions.

2. Install equipment on a flat and level reinforced concrete pads.

3. Coordinate pad requirements for both size and vibration control, provide auxiliary water piping and drains necessary to the equipment operation.

4. Confirm final connections to equipment prior to performing work.

5. Install gas piping in open or ventilated spaces. Pitch lines and provide drip legs for condensation collection points.

B. Water Piping: Provide a gate valve and a hose bibb drain on water supply line where it enters building. Provide gate valves to zone building at each level, branch lines serving more than 3 fixtures, and as indicated on Drawings. Provide dielectric unions with appropriate end connections for the pipe materials in which installed (screwed, soldered, or flanged), which effectively isolate dissimilar metals, prevent galvanic action and stop corrosion.

C. Waste and Vent Piping

1. Slope soil waste lines inside and outside building in accordance with requirements of governing Plumbing Codes, in flow direction shown on the drawings.

2. Establish grade lines with surveyor's level. Verify location of sewer taps before start of work and make necessary grade adjustments. Drain vent lines back to waste lines.

3. Locate cleanouts at each 90 degrees or greater change of line direction and at maximum 75 feet intervals.

4. Bring exterior cleanouts up to grade; provide concrete box with cast iron cover over each exterior cleanout.

5. Flush piping clean with water after installation.

6. Lubricate cleanout plugs with mixture of graphite and linseed oil. Prior to final acceptance, remove cleanout plugs, relubricate and reinstall using only enough force to insure permanent leak-proof joint.

7. Extend water heater relief valve discharge lines full size to nearest available floor drain or to daylight as indicated on drawings. Do not trap lines.

8. Install trap primer for each floor drain and/or floor sink having a trap primer connection. Provide access panels.

PART 4 - TESTS

4.01 TESTS

A. Complete and test pipe rough-in before insulation or other finish work is applied. Covering of work before acceptance is prohibited.

B. After completion, inspect and test fixtures and systems for adequate water pressure, flow, and proper flushing action. Make necessary adjustments.

Cooperate with other trades on testing fixtures and equipment involving work under this section.

END OF SECTION

SECTION 15180 - GENERAL PIPE AND FITTINGS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes piping materials and installation requirements for various services.

1.02 SUBMITTALS

A. Comply with provisions of Division 1, to include pipe and fitting types and materials.

B. Submit certification of domestic water system flushing and disinfection.

C. Submit verification of hydronic water system flushing.

D. Submit qualifications and a listing of the names of the welders, together with corresponding marks.

1.03 QUALITY ASSURANCE

A. Welding materials and labor shall comply with ASME Code and applicable state labor regulations.

B. Welders shall be fully qualified and certified by a state approved welding bureau.

1. Each welder shall identify his or her work with a marking stamped on each weld joint of pipe, valve or fitting.

2. Welders making defective welds after passing qualification test shall be given a requalification test and upon failing to pass shall not be permitted to work on this Project.

C. Provide Domestic water drainage, and vent piping per each applicable building code.

D. Provide Gas piping per local utility company requirements.

1.04 DRAWINGS

A. Accompanying Drawings are intended for Contractor’s guidance. Verify accuracy and immediately notify Architect of any discrepancies.

1. Anticipate and coordinate minor changes in position of piping to meet job conditions. Such minor changes shall not be made the bases for RFIs and Change Orders.

2. Promptly communicate to Architect changes affecting accessibility to or clearance about equipment or accessories.

1.05 SIZES

A. Conflicts or inconsistencies of pipe sizes, arrangements, and details for final connections shall be resolved by the Architect.

1.06 PIPING DIAGRAMS

A. Construction Documents may include piping diagrams as a part of the working Drawings.

1. These piping diagrams are not for the purpose of giving physical dimensions or locations but rather to show all required piping accessories necessary to make clear the interconnections, by the piping, of the various units of the process.

2. If an item is shown on either the piping diagram or the piping detail Drawings, but not on both, it will be assumed that the Contractor has included the item in the project cost, including installation thereof.

1.07 PIPE LENGTHS

A. In assembling piping systems, utilize longest available commercial standard piping lengths to minimize number of piping joints.

B. Accurately cut pipe to field measurements to permit placement without forcing or springing, except for cold springing of expansion loop legs

PART 2 - PRODUCTS

2.01 GENERAL

A. Piping shall comply with material specification Sections listed in the following schedule:

PIPING SERVICE SCHEDULE				
Service	Maximum Service Pressure	Maximum Service Temperature	Material	Specification Reference Section and Article
Soil, waste and vent, aboveground	60 psi	140 degrees F	Cast iron, no hub	23 21 20, 2.01
Condensate drain for equipment and drip pan drains or overflows	10 psi	100 degrees F	PVC 80 – With Insulation	23 21 21, 2.01
Chilled water and heat recovery 4” and larger	125 psi	100 degrees F	Black steel, Schedule 40	23 21 22, 2.01
Chilled water and heat recovery 3” and smaller	125 psi	100 degrees F	Type L drawn copper	23 21 21, 2.01
Domestic water, aboveground	125 psi	250 degrees F	Type L drawn copper	23 21 21, 2.01

PART 3 - EXECUTION

3.01 PIPING INSTALLATION

A. Install piping in accordance with the ANSI Standard Code for Pressure Piping B3l.1, latest issue.

1. Provide anchorage of piping, guides, and supports in accordance with Section 15062 Hangers and Supports for HVAC Piping and Equipment.

2. Refer to Section 15111 General-Duty Valves for HVAC Piping for valves installation in conjunction with piping arrangement.

3. Run piping straight and parallel with adjacent walls.

B. Piping located on roofs shall be mounted on curbs or other pipe supports to ensure that bottom of pipe elevation is a minimum of 12 inches above roof surface.

3.02 PREPARATION

A. Ream pipes and tubes to full inside diameter. Clean off scale and dirt, inside and outside, before assembly. Remove welding slag or other foreign material from piping.

3.03 CONNECTIONS

A. Refer to individual piping Sections for method of joining.

B. Use full-cut standard taper pipe threads. Make up joints using Teflon® tape or nontoxic joint compound as related to the piping system involved. Apply to male threads only.

C. Use main-sized “Weld-O-Let” or “Thread-O-Let” branch connections or “Stub-in” in stee1 piping if main is at least one pipe size larger than the branch for up to 6 inches mains and if main is at least two pipe sizes larger than branch for 8 inches and larger mains. Do not project branch pipes inside the main pipe.

D. Joints for PVC DWV pipe shall be glued. C.I. pipe to use no-hub couplings.

E. Make connections to equipment and branch mains with unions or flanges.

F. Provide non-conducting type connections wherever joining dissimilar metals in all systems and at equipment connections. Brass adapters and valves are acceptable. Do not mix dissimilar piping materials within subsystems of piping.

G. Refrigerant piping shall be purged with nitrogen or carbon dioxide during brazing or soldering operations.

H. Install grooved coupling in accordance with the manufacturer's recommendations, as follows:

1. Pipe: Ends shall be clean and free from indentations, burrs, roll marks, etc., in the area from pipe end to groove. Pipe ends shall be square cut.

2. Lubrication: A uniform coat of non-toxic lubricant shall be applied to the pipe ends around the entire circumference, the entire exterior of the gasket, the gasket lips and the inside of the coupling housing.

3.04 ROUTE AND GRADES

A. Route piping in orderly manner and maintain proper grades. Coordinate and install to conserve headroom and interfere as little as possible with use of space. Run exposed piping parallel to walls. Group piping whenever practical at common elevations. Install concealed pipes close to building structure to keep furring to a minimum.

B. Expansion, Contraction and Bending: Install piping with provisions for expansion and contraction.

1. Provide expansion loops, swing joints, and/or expansion pipe guides where indicated and otherwise required.

2. Do not spring or force piping during installation.

3. Do not bend piping without use of pipe bending machine.

C. Sloping, Air Venting and Draining:

1. Slope piping as indicated.

2. Unless indicated otherwise, true to line and grade, and free of traps and air slope piping in direction of flow as follows:

Service	Inclination	Slope
Domestic Water	Level	
Chilled Water	Level	
Condensate Drain	Down	1/8 inch per foot
Waste	Down	1 /4 inch per foot/ 1/8 - 5" & larger when fixture unit carrying load is not affected
Storm Water	Down	1 /4 inch per foot/ 1/8 – 5" & larger when fixture unit carrying load is not affected

3. Reducers:

a. Eccentric:

1) In horizontal steam and condensate piping, bottom side flat.

2) Heating water and chilled water piping, top side flat.

3) Between water piping and pump suction.

b. Concentric

1) In vertical piping.

2) May be used as increasers in horizontal piping.

4. Connect chilled water branch piping to bottom of main.

5. Provide drain valves and hose adapters at all low points in piping.

6. Provide drain valves for float type controllers.

7. Provide manual air vents at all high points in heating water, chilled water, and condenser water piping.

a. 1/2 inch copper tube.

b. Discharge vented water into nearest janitor's sink or floor drain.

3.05 IDENTIFICATION

A. Identify piping flow direction and contents. Refer to Section 15190 - Mechanical Identification.

3.06 CLEANING AND TESTING

A. Perform testing procedure in the presence of the Architect or Owner's representative and/or authorities having jurisdiction. Refer to Section 15960 - Commissioning of HVAC.

B. Complete and test pipe rough-in before insulation or other finish work is applied. Covering of work before acceptance is prohibited.

C. Do not test relief valves, pressure-reducing valves, valves, or equipment beyond its rated capacity.

D. Drainage Piping Systems (Waste, Vent and Storm Drain):

E. Rush pipe with clear water to remove dirt and debris.

F. Pressure test complete system with water with 10 feet of head for 1 hour with no leak. Visually inspect joints for leaks, repair or replace, and pretest.

G. Domestic Water Piping System:

1. Flush pipe free of dirt and debris with fresh water.

2. Disinfect lines in accordance with the Uniform Plumbing Code with fluid chlorine or Hypochlorite.

a. Introduce sufficient chlorine to provide an initial concentration of 50 ppm.

b. Disinfect for 24-hour period, opening and closing valves in system at various points and at the end of the line during disinfection.

c. Check residual chlorine concentration. If less than 25 ppm, flush system and repeat disinfection procedure with 50 ppm solution for 24 hours and continue to repeat until residual concentration is equal to or greater than 25 ppm.

d. Following chlorination, thoroughly flush complete system until replacement water is same quality as incoming city water. Submit certification.

3. Pressure test complete system with water at 1-1/2 times the working pressure, but not less than 150 psi, for 3 hours with no decay in pressure. Use higher pressure where indicated or where required for building height or by authorities having jurisdiction. Visually inspect joints for leaks, repair or replace, and retest.

F. Chilled Water, Water Piping System:

1. Flush entire system with fresh water by circulation and periodically clean strainers. Continue flushing until strainers show no visible sediment, then drain system.

2. Circulate entire system with a detergent or other chemical and water solution to remove scale and rust for 8 hours. Drain and reflush with clear water.

3. Pressure test with water at 1-1/2 times the working pressure, but not less than 150 psi, for 3 hours with no decay in pressure. Visually inspect joints for leaks, repair or replace, and retest.

G. Refrigerant Piping System:

1. Charge the low and high-pressure side of the system with a dry, inert gas as required by ANSI B3I.5.

a. Use a pressure limiting or reducing valve with pressure gauge on high-pressure side to limit the pressure in the system to the specified test pressure for the respective refrigerant.

b. Maintain pressure without decay for 30 minutes minimum.

2. Evacuate refrigerant system with vacuum pump until 35 degrees F is indicated on vacuum dehydration indicator. Maintain vacuum for a period of 5 hours after closing valve between pump and system.

3. Break vacuum with refrigerant gas and allow pressure to build to 2 psi and hold prior to completing the system charge.

3.07 PIPING SYSTEM LEAK REPAIR

A. Repair leaks which occur during the period of warranty, including any building damage or refinishing costs, at no cost to Owner.

B. Repair all defects which develop under tests promptly and repeat the tests. No caulking of screwed joints, cracks, or holes will be permitted.

C. Repair leaks in copper tubing by melting out the joint, thoroughly cleaning both parts, and resoldering the joint Refrigeration piping repairs shall meet requirements of ASME Code B31.5, Chapter VL For leaks in copper tubing of medical gas systems, the entire system must be recertified for cleanliness.

D. Minor leaks in welded joints may be chipped out and rewelded. A general sweating of a welded joint may be cause for rejection of the entire joint.

E. Repair leaks in threaded pipe by replacing the thread or the fitting or both. Any replacement piece shall be the same length as the piece removed.

END OF SECTION

SECTION 15181 - HYDRONIC PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes steel pipe materials, fittings, and valves for chilled water.

1.02 QUALITY ASSURANCE

A. American Society for Testing Materials (ASTM) PART 2 PRODUCTS

PART 2 - PRODUCTS

2.01 STEEL PIPE

A. Pipe through 10 inches: Schedule 40, black steel, ASTM A 53 B.

B. Pipe 12 inches and Larger: 0.375-inch wall, black steel, ASTM A 53 B.

C. Underground chilled water and reheat water lines shall be double wall, with carrier piping as specified above, and PVC conduit pipe with urethane insulation. Provide expansion loops or expansion joints where required by the prefabricated pipe manufacturer. Provide rigid joints for expansion loops or thrust restrained joints for expansion joints.

2.02 STEEL FITTINGS AND JOINTS

A. Threaded Fittings 2 inches and Smaller: Black malleable or cast iron, ANSI B 16.3, Class 125.

B. Welded Fittings 2-1/2 inches and Larger: Forged steel, ANSI B 16.11 for socket weld and ANSI B 16.9 for butt weld.

C. Unions: Black malleable or cast iron, ANSI B 16.3, Class 125.

D. Flanges: Forged steel, ANSI B 16.5. Bolts and nuts shall be ASTM A 307, Grade B. Gaskets shall be 1/16 inch thick compressed asbestos-free with nitrile binder Garlock No.3000 or equal.

E. Grooved couplings in steel pipe 2-1/2 inches and larger (except for heating hot water, natural gas) shall be provided in accordance with the following:

1. Housing: Ductile iron conforming to ASTM A-536 or malleable iron conforming to ASTM A-47, coated with non-toxic paint or hot dip galvanized.

2. Gasket: Type 'E,' EPDM as designated by ASTM D-2000 with temperature range -30 to +230 degrees F.

3. Bolts and Nuts: Heat-treated carbon steel, oval neck track head bolts and heavy hex nuts conforming to ASTM A-183; both shall be zinc electroplated.

4. Couplings shall have minimum rated working pressure of 300 psig.

5. Couplings shall bear UL stamp. Submit proof of conformance with UL testing standard 213.

F. Grooved Fittings in steel pipe 2-1/2 inches and larger (except for heating hot water, natural gas) shall be provided in accordance with the following:

1. Grooved fittings shall be cast ductile iron or malleable iron, forged steel or segmentally welded steel.

2. Fittings shall be rigid coupling type and shall have minimum rated working pressure of 300 psig.

2.03 SEAMLESS COPPER TUBE FOR DOMESTIC WATER, HEATING AND CHILLED WATER, CONDENSER WATER, COMPRESSED AIR, OR PAN DRAINAGE

A. Pipe

1. Aboveground: Types K, L, and M, hard drawn copper tubing, ASTM B 88. Refer to Section 23 21 13 - Pipe and Pipe Fittings — General.

B. Fittings:

1. Fittings: Wrought copper, ANSI B 16.22, 83 percent copper content minimum. Fittings shall be factory manufactured.

2. Bronze flanges and Flange Fittings: ANSI B 16.24, 150 psi.

3. Cast Bronze Fittings for Flared Copper Tubes: ANSI B16.26, 175 psi.

4. Wrought copper, socket T-type joint, ASTM B 88 and ANSI B16.22. Couplings shall be of the staked stop type.

C. Joints:

1. Underground: Silver brazing and noncorrosive flux.

2. Aboveground Other Than Domestic Water and Compressed Air: ASTM B 32.70 95/5 solder and noncorrosive flux.

3. Aboveground Domestic Water: Lead and antimony free Harris Stay Safe or Taracorp Taramet Sterling solder and noncorrosive flux. 2½" and larger joint shall be silver brazing.

4. Compressed Air: Silfos.

5. Aboveground Heating and Chilled Water: Silver brazing alloy shall comply with ANSI/AWS A5.8, class B-Cup.5. Use care in silver brazing to prevent over-heating of pipe and fitting.

D. Refer Section 23 05 23 - Valves and Cocks.

2.04 COPPER DRAINAGE TUBE (DWV)

A. Copper Tubing: ANSI H23.6, ASTM B 306, suitable only for non-pressure application above grade, such as chilled water coil condensate drainage.

B. DWV Fittings: Cast bronze, ANSI B 16.23, or wrought copper, ANSI 16.29, designed for drainage and vent systems.

C. Joints: 95/5 solder.

2.05 REFRIGERATION PIPING

A. Copper Tubing: ASTM B 280, Type ACR, hard-drawn straight lengths, and soft-annealed coils, seamless copper tubing. Tubing shall be factory cleaned, ready for installation, and have ends capped to protect cleanliness of pipe interiors prior to shipping.

B. Copper Tubing: ASTM B 88, Type L, hard-drawn straight lengths, and soft-annealed coils, seamless copper tubing.

C. Fittings: Wrought copper, ANSI B 16.24, 150 psi.

D. Joints: Use silver solder and non-corrosive flux.

E. Valves and Sight Glasses: Alco or Henry.

F. Oil Loops and Double Risers: Provide to assure successful operation.

G. Alter each refrigeration piping system is completed it shall be tested with compressed air for a period of 4 hours. After each system is proven tight it shall be evacuated with a vacuum pump for a period of 2 hours to remove all air and moisture before charging with refrigerant.

PART 3 - EXECUTION

3.01 INSTALLATION

Refer to Section 15180 General Pipe and Fittings

END OF SECTION

SECTION 15190 - MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes requirements for valve identification, equipment identification, piping and ductwork identification.

1.02 SUBMITTALS

A. Comply with provisions of Division 1.

B. Submit valve tag chart, lists of pipe, duct and equipment to be labeled and color chart.

C. Product Data: Manufacturer's latest published data for materials, equipment and installation, including samples of valve and damper tags, equipment identification and piping/ductwork identification.

1.03 QUALITY ASSURANCE

A. American National Standards Institute (ANSI):

1. A13.l - 1981: Scheme for identification of piping systems.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Brady

B. Seton

C. All tagged components shall be in accordance with ANSI Al3.l - 1981.

D. For valves and automatic dampers, use metal tags 2 inches minimum diameter, fabricated of brass or stainless steel.

E. Attach tags with jack chain of same materials.

F. For stamped tags, use 1/4 inch high letters.

G. For labels, letters to be 2 inches high. Smaller letters may be used only when space does not permit 2-inch high lettering.

H. Pressure sensitive tapes are acceptable.

PART 3 - EXECUTION

3.01 VALVES

A. Tag valves with identifying number and system. Number valves by floor level. Do not tag equipment isolation valves.

B. Tag all balancing valves with final accepted gpm per final balancing report.

C. Prepare lists of tagged valves indicating location, floor level, tag number, system type (or number) and use. Prepare separate lists of each system. Include copies in each maintenance manual.

D. Prepare a 48 x 36 flow diagram of each system indicating tag number. The flow diagram shall be framed with glass or laminated face and be mounted in the plant operation office.

3.02 DAMPERS, VOLUME

A. Tag major volume dampers (more than 2,500 cfm) in exhaust air systems.

B. Tag dampers with identifying number and system. Number dampers by floor level.

C. Tag all balancing dampers with final accepted cfm per final balancing report.

D. Prepare lists of tagged dampers indicating location, floor level, tag number, system type (or number) and use. Prepare separate lists of each system. Include copies in each maintenance manual.

3.03 EQUIPMENT

A. Identify equipment with identical letters and/or numbers as used on drawings. Where space is available use full name of equipment.

3.04 CONTROLS

A. Controls identification shall be as specified in Section 15900 HVAC Instrumentation and Controls. Also identify controls such as float switches, alarms, remote pushbutton switches with 1-1/4-inch high lettering and laminated plastic plates glued or chained to equipment.

3.05 PIPING

A. Provide piping systems with snap-on or self-adhesive color-coded banding markers on piping which is either exposed or concealed in accessible spaces. For piping systems, other than drain and vent lines, include generic name of system or its abbreviation, and include arrows to show direction of flow. Comply with ANSI A13.I for color selection and band width standards. Locate markers at ends of lines, near major branches and other interruptions including equipment in the line, where lines pass through floors, walls, or ceilings or otherwise pass into inaccessible spaces, and at 30-foot intervals

along exposed portions of lines. Do not mark short and repetitive piping branches.

3.06 DUCTWORK

A. Ductwork identification shall consist of stencil-painted identification on insulated or uninsulated ductwork and housings of the air handling systems; including arrows to show flow, system numbers and generic name of service. Mark primary runs at housing and main branches, and mark access doors to indicate equipment in housing or duct. Mark ductwork at 25 feet intervals. Where concealed behind removable ceilings, markings may be by plasticized tags in lieu of stencil-painted markers.

END OF SECTION

SECTION 15213 - MEDICAL GAS PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes piping, valves, installation and testing requirements for medical gas systems including, but not limited to, the following:

1. Medical Air System.

2. Medical Vacuum System.

3. Oxygen system

1.02 REFERENCES

A. NFPA 99, Standard for Health Care Facilities.

B. CGA Pamphlet P-2.I, Medical/Surgical Vacuum Systems.

C. CGA Pamphlet GA. 1, Cleaning Equipment for Oxygen Service.

D. CGA Pamphlet 0-7.1, Commodity Specification for Air.

E. ANSI/AWS A5.8, Specification for Filler Metals for Brazing.

1.03 SUBMTITALS

A. Provide submittals in accordance with provisions of Division 1.

B. Submit testing agency certification.

1.04 COORDINATION

A. Testing agency shall coordinate with the general/mechanical contractor for medical gas piping installation schedule.

PART 2 -PRODUCTS

2.01 PIPING AND ACCESSORIES

A. Piping: Seamless copper pipe, ASTM B 819, Type K annealed for underground use and Type L hard drawn above ground, reamed free of burrs to full inside diameter, with chips removed.

B. Fittings: Wrought copper joint pressure type per ANSI B 16.22, ASTM B 819, suitable for brazing.

C. Certification: Provide piping, valves, and fittings factory cleaned, inspected, tested, packaged and labeled in accordance with CGA Pamphlet G-4.1,

certified accordingly in writing. Deliver written certification to the Architect prior to the start of installation.

D. Piping System Joining Processes: As recommended by manufacturer of pipe and fittings.

1. Pass a sufficient continuous flow of dry nitrogen through the piping during the brazing procedure to ensure that oxides of copper do not form anywhere inside the medical gas system.

2. Brazing shall be performed by brazers certified to AWS B2.2.

E. Joints: Joints shall be made using minimum 1000 degree F melting temperature, BCUP brazing filler without flux, and shall comply with AWS A5.8.

F. Check Valves: Cast bronze, straight pattern, positive seal with self-aligning, spring-loaded ball type check valve and cone seat.

G. Single Seat Brass Body Relief Valve: Brass body, preset at 75 psi, with automatic reseating and discharge to atmosphere.

H. Pressure Regulator: Regulator, complete with gauges, cleaned for oxygen service and complying with NFPA 99.

I. ProPress fittings are not allowed.

2.02 MAIN AND RISER BASE VALVES

A. Valves: Bolted union ball type with Type L copper tubing extensions, bronze swing-away type body, brass or bronze ball, Buna-N seat and stem seals, quarter turn handles, and a locking plate.

1. Valves shall be designed for vacuum and working pressure up to 400 psi.

2. Valves shall be factory cleaned for oxygen service.

2.03 AREA/ZONE VALVES

A. General: Recess valves in wall boxes constructed of extruded aluminum having an anodized window frame with mitered welded corners, shatter resistant easily removable window with emergency pull ring, appropriately labeled. A closed valve prevents the installation of the window.

B. Valves: Similar to main valves except with extensions. Provide an extension on the outlet side with a line pressure monitoring gauge located within the box. Color code and label each valve to identify its service.

C. Multiple Valves: Housed within a single box.

2.04 QUICK-CONNECT RECESSED WALL AND CEILING OUTLETS

A. Outlets: Ohmeda Diamond III quick-connect type, provided for oxygen, vacuum, nitrous oxide, and medical air service, UL listed conforming with applicable NFPA and CGA Standards. Outlets shall consist of separate rough-in and finish assemblies of modular design.

B. Rough-in Assembly: Corrosion resistant with a secondary check valve and a specific gas pin keying system which shall allow pressure testing without additional labor to remove plug or adapter after testing.

C. Finishing Assembly: Includes a primary check valve, pin key indexing, designed to assure absolutely no gas flow until proper adapter is fully engaged. Color coding and appropriate cover plates shall be provided. Vacuum outlets shall have adjacent slides for bottle support.

1. Amico Alert-1 series or approved equal

2.05 MASTER ALARM

A. Master Alarm: Existing master alarms in Security office and Engineer's office shall be expanded to accept signals from the new medical air and medical vacuum local alarms, main line pressure sensors from oxygen, nitrogen, and nitrous oxide mains at the new building.

2.06 ALARM RELAY INTERFACE CABINET

A. Interface Panel: Transfers medical gas alarm signals from the master alarm to the facility central control computer without interrupting the closed circuit system. The panel cabinet shall provide a circuit for each signal of the master alarm.

B. Unit Controls: Include a 120/28.5 volt transformer, solid state low voltage DC power supply, relays, and input and output terminal blocks to provide totally isolated output signals with both normally open and normally closed contacts.

C. Electrical Work: 120 volt, 60 Hz power provided under Division 16. Provide medical gas alarm and interlock signal wiring electrical work under this Section, refer to Drawings.

2.07 AREA/ZONE ALARMS

A. Area/zone Alarms: Shall be recessed, UL and CSA listed, audio-visual, closed circuit, self-monitoring, solid state type with plug-in circuit boards, integral 120/28.5 volt step down transformer, pressure sensor switches, and full range line pressure gauges.

1. Open circuit alarms which do not monitor alarm signal wiring integrity will not be acceptable.

2. Area/zone alarms shall be provided per NFPA 99.

B. Rough-in Assembly: Provide self-sealing check valves for easy removal of finish assembly to facilitate servicing without system shut down.

C. Electrical Work: 120 volt, 60 Hz power provided under Division 16. Provide medical gas alarm and interlock signal wiring electrical work under this Section, refer to Drawings.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. Degrease, clean, dehydrate, and cap pipe for medical gas usage, per CGA Pamphlet GA. 1. Piping shall be reamed and deburred at all connections.

B. Daily label piping as to gas service during erection to maintain continuity and system integrity.

C. Confirm final connections to equipment to assure that no cross-connections exist.

3.02 TESTING

A. Provide gases necessary to complete testing procedures through to certification.

B. Complete and test pipe rough-in in accordance with NFPA 99 before any finish work is applied. Covering of work before acceptance is prohibited. Certify system testing completion to Architect.

C. Medical gas systems, including source equipment, valving, alarms, and use point outlets shall be evaluated and certified for mechanical and therapeutic function as defined by NFPA 99, CGA Pamphlet P-2.1, and state and local authorities having jurisdiction thereto.

1. This testing shall be performed by an agency independent of the facility, contractor or their suppliers.

2. The agency shall specialize in medical facilities and shall be able to demonstrate experience and expertise in medical gas installations.

3. The testing agency shall be hired by the Owner and be supported by the Contractor throughout the testing period.

D. The agency shall provide to the facility full documentation of the following:

1. That all medical gas systems as constructed follow guidelines of NFPA 99, regarding placement and applicability of valves, alarms, and source equipment. The agency shall not be responsible for evaluation of plumber’s technique in such elements as routing and hangers except as required by paragraphs that follow.

2. That no cross-connections exist in pipelines as constructed. Documentation shall include examination of the outflow of each outlet, following NFPA 99 mechanical cross-connect procedures. Additionally, examine each outlet outflow with an appropriate analyzer and document concentrations. Include oxygen, nitrous oxide, medical air, nitrogen, and vacuum systems in the mechanical examination.

3. That all outlets axe delivering gas at a pressure and flow consistent with anticipated needs, as defined by responsible authorities within the facility, but in no case less than CGA or NFPA guidelines.

4. That the pipelines are free of debris, including liquid.

5. That all outlets are functional.

6. That delivered gas purity complies with applicable CGA/USP specifications for breathing gas.

    a. Take samples from each station outlet for oxygen, mixed gases containing oxygen, and medical compressed air, and test with an oxygen analyzer to confirm the presence of the desired percentage of oxygen.

    b. Evaluate samples against CGA/USP requirements for human use and compare to one another.

7. That reserve source equipment and its control equipment is in place and operational.

8. That valves are functional. Document the location of control zones without regard to plans. Compare documentation with as-built plans and report discrepancies between the actual installation and the plans to the Owner.

9. That all alarms are set and functioning in accordance with NFPA 99. The surveillance areas of each shall be documented and compared per 3.3.D.8 above.

10. That medical air is dry. The examination shall consist of a dewpoint reading taken at source and most distant outlet of each lateral branch. Document temperatures and pressures affecting dryness.

11. That systems bear appropriate labels in accordance with NFPA 99.

E. Documentation shall be provided by the testing agency to the owner and contain the above information as the certification. These documents become part of the facility's permanent records. Certification shall be provided upon successful completion of tests. The Contractor shall not be released from contractual obligations until certification is obtained.

END OF SECTION

SECTION 15240 - MECHANICAL SOUND, VIBRATION

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes vibration isolation devices, frames, guides, and related material, including seismic restraints.

B. Vibration isolation products furnished as part of a factory fabricated equipment are specified as part of equipment assembly in other Division 23 sections.

1.02 GENERAL

A. The objective of this Section is to provide the necessary Specifications for the avoidance of excessive noise or vibration in the building due to the operation of machinery or equipment and/or due to interconnected piping, ductwork, conduit, or structure.

B. Specific applications, features or methods unique to a given phase of work will be delineated in other Divisions or Sections of the Specifications.

1.03 QUALITY ASSURANCE

A. All equipment and accessories shall be the product of a manufacturer regularly engaged in its manufacturer.

B. All items of a given type shall be the same manufacturer

C. Provide necessary design for avoidance of excessive noise and vibration in the building due to operation of machinery or equipment, or due to interconnected piping, ductwork or conduit.

D. Installation of all vibration isolation units, and associated hangers and bases, shall be under direct supervision of the vibration isolation manufacturer’s representative.

E. Manufacturer shall include in bid price field inspection and written report that the installation is in accordance with the manufacturer’s standards and recommendations.

1.04 WORK CRITERIA

A. Isolate all motor-driven mechanical equipment from the building structure, and from the systems which they serve, to prevent equipment vibrations from being transmitted to the structure.

B. Consider equipment weight distribution to provide uniform deflections.

C. For equipment with variable speed capability, vibration isolation device selection shall be based upon the lowest speed.

D. All equipment including piping and ducts that are mounted or hanged on vibration isolator shall be seismically restrained.

1.05 SUBMITTALS

A. Comply with provisions of Division 1.

B. Submit shop drawings including load calculations for selection of isolation devices indicating isolation materials, isolator heights both free and operating, isolator dimensions, deflections, supplemental bases and isolation efficiency based on lowest operating speed. Consider that load may be not evenly distributed to all isolators.

C. Submit flexible pipe connector shop drawing data including maximum allowable temperature and pressure rating, overall face-to-face length, and elongation. In addition, include one test report by an independent consultant showing minimum reduction of 20 DB in vibration accelerations and 10 DB in sound pressure levels at typical blade passage frequencies.

D. Submit Engineered Calculations for all vibration isolators, seismic snubbers, anchor/guide loads and selections. Calculations must be sealed by a licensed Structural Engineer registered in the State of Hawaii. Coordinate with Section 23 05 48 Supports, Anchors, and Seals.

E. Seismic Requirement: Submittals shall include weights, corner weights, center of gravity, load distribution per isolator dimensions, standard connections, manufacturer's recommendations, calculations, behavior problems (vibrations, thermal expansions, etc.) associated with the equipment or piping.

F. Submit manufacturer's installation requirements.

G. Submit start-up, calibration, and system check out procedures.

1.06 COORDINATION

A. Work under this Section must be coordinated with other structural, mechanical, and electrical work in order to accomplish interfacing necessary to provide a complete and operating system in compliance with intent of Contract Documents.

B. Coordinate selection of devices with isolator and equipment manufacturers.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Mason Industries

B. Amber-Booth Company

C. Kinetics Noise Control

D. M. W. Sausse & Co.

E. Mason Industries is specified to establish type and quality.

2.02 MATERIALS

A. Provide isolation devices for the equipment with which they are to be used. Materials used shall retain their isolation characteristics for the life of the equipment served. Elastomeric materials shall be industrial grade neoprene. Provide isolation devices subjected to weather with hot-dipped galvanized finish.

2.03 VIBRATION ISOLATION DEVICES

A. Floor Mountings:

1. Type N Mounts (High-Frequency Vibration):

a. Mason type ND or rails type DNR, double deflection neoprene mounts with cast-in metal inserts for bolting to equipment.

b. Both surfaces rib molded for skid resistance. On equipment such as small vent sets and close coupled pumps, steel rails shall be used above the mountings to compensate for the overhang.

2. Type S Mounts (Low-Frequency Vibration):

a. Mason Type SLY combination spring and neoprene with rib molded base. Freestanding, laterally stable without any housing, complete with 1/2 inch neoprene acoustical friction pads between the baseplate and the support.

b. Provide with leveling bolts rigidly bolted to the equipment. Springs shall have a minimum additional travel to solid equal to 50 percent of the rated deflection. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load.

3. Type SS Mounts:

a. Mason Type SLR combination spring and neoprene with rib molded base similar to type S mounts, except with a housing that includes vertical limit stops to prevent spring extension when weight is removed.

b. Installed and operating heights shall be the same. Maintain a minimum clearance of 1/2 inch around restraining bolts and between the housing and spring to eliminate interference with spring action. Limit stops shall be out of contact during normal operation.

B. Hangers:

1. Type H Hangers: Mason Type 30N vibration hangers with a steel spring and 0.3 inch deflection neoprene element in series. Neoprene element shall be molded with a rod isolation bushing that passes through the hanger box. Spring diameters and hanger box lower hole sizes shall be large enough to permit hanger rod to swing through a 15 degree arc before contacting the hole and short circuiting the spring. Springs shall have a minimum additional ‘ravel to solid equal to 50 percent of the rated deflection.

2. Type HP Hangers: Mason Type PC3ON vibration hangers similar to Type H, but precompressed to rated deflection to keep piping or equipment at a fixed elevation during installation. Design hangers with a release mechanism to free the spring after installation is complete and hanger is subjected to its full load.

3. Type HES Hangers:

   a. Mason Type HES steel spring hangers with steel housing and deflection indicator scale. Preset at the factory for the load involved. Hangers shall be capable of 130 percent of rated deflection, but no more than 100 percent of rated deflection shall be used when selecting the hanger.

   b. Submittals shall include isolator-rated deflection, equipment load deflection, and supporting calculations. Calculations shall be made by a registered structural engineer demonstrating the structural adequacy of the hanger and that its connections to the building and pipe are adequate for live and dead loads encountered.

4. Type W Hangers: Mason Type W30 steel springs in a neoprene cup with a grommet to prevent short circuiting of the hanger rod. Provide neoprene cup with a steel washer designed to properly distribute the load on the neoprene and prevent its extrusion. Spring diameters and hanger box lower hold size to be large enough to permit the hanger rod to swing through a 30 degrees arc before contacting the hole and short circuiting the spring. Springs to have a minimum additional travel to solid equal to 50 percent of the rated deflection. Provide hangers with an eye bolt on the spring end and provision for attaching the housing to the flat iron duct straps.

5. Type AG Pipe Anchors and Guides:

   a. Mason Type ADA or ADAR directional acoustical pipe anchors and guides for vertical piping, consisting of a telescopic arrangement of 2 sizes of steel tubing separated by a minimum 1/2 inch thickness of heavy-duty neoprene and duct or neoprene isolation material. Vertical restraints shall prevent vertical travel in either direction. Allowable loads on the isolation materials shall not exceed 500 psi and the design shall be balanced for equal resistance in any direction.

b. Submittals shall include supporting calculations by a registered structural engineer indicating anchor/guide loads and isolator selection.

C. Pads (Type D), Washers (Type W) and Bushings (Type L): Pads shall be Mason type WM, neoprene waffle pads, 40 durometer. Complete with steel top plate and drifted for anchor bolt. Washers and bushings shall be reinforced duck and neoprene, select number and size of pads to accept the equipment operating weight evenly.

D. Snubbers (Type Z): Mason Type Z-1225. Each spring mounted base shall have a minimum of four all directional seismic snubbers that are double acting. Elastomeric materials shall be shock absorbent neoprene bridge quality bearing pads, maximum 60 durometer, replaceable and have a minimum thickness of 1/4-inch. Air gap between hard and resilient material shall be not less than 1/8-inch npr more than 1/4-inch. Restraints shall be capable of withstanding design load without permanent deformation.

E. Type T Thrust Restraints: Mason Type WB, horizontal thrust restraint consisting of a spring element in series with a neoprene pad as described for Type 2 mounts, with the same deflection as specified for the mountings or hangers. The spring element shall be contained within a steel frame and designed so it can be preset for thrust at the factory and adjusted in the field for a maximum of 1/4 inch movement at start and stop. Furnish thrust restraints complete with rods and angle brackets for attachment to both the equipment and ductwork or equipment and structure. Attach horizontal restraints at the centerline of thrust and symmetrically on either side of the unit.

F. Bases:

1. Type J Bases: Mason Type MSL rectangular structural steel frame with height saving brackets and motor slide rails.

2. Type S Bases: Mason Type WF structural steel bases, rectangular in shape for equipment other than centrifugal refrigeration machine bases which may be “T” or 1L” shaped. Perimeter members shall be beams with a minimum depth equal to 1/10 of the longest dimension of the base. Beam depth need not exceed 14 inches provided that the deflection and misalignment is kept within acceptable limits as determined by manufacturer. Employ height-saving brackets in all mounting locations to provide a base clearance of 2 inches to facilitate housekeeping beneath bases.

3. Type I Bases: Mason Type K or BMK rectangular structural beam or channel concrete forms for floating foundations. Provide bases for pumps large enough to support suction and discharge base ells. Base depth need not exceed 12 inches unless specifically recommended by base manufacturer for mass or rigidity. Bases shall be a minimum of 1/12 of the longest dimension of base, but not less than 6 inches. Forms shall include minimum concrete reinforcement consisting of 1/2 inch bars, or angles welded in place, on 6-inch centers running both ways in a layer 1-1/2

inches above the bottom or additional steel as is required by the structural conditions. Provide forms with drilled steel member with sleeves welded below the holes to receive equipment anchor bolts where anchor bolts fall in concrete locations. Employ height-saving brackets in all mounting locations to maintain a 2-inch clearance below the base to facilitate housekeeping beneath bases.

2.04 FLEXIBLE PIPE CONNECTORS

A. Refer to Section 15062 Hangers and Supports for HVAC Piping and Equipment.

B. Installation shall be in accordance with manufacturer guidelines.

C. Manufacturer: MetraFlex, Flexonic or Hyspan.

PART 3 - EXECUTION

3.01 VIBRATION ISOLATION DEVICE APPLICATION

A. Unless shown on the drawings, select vibration isolation devices to provide minimum 95 percent isolation efficiency or based on the minimum static deflection and the following mounting criteria, whichever is greater:

Description	Grade supported Slab or basement Floor		20' Floor Span Upper Levels		30' Floor Span Upper Levels		40' Floor Span Upper Levels	
	Minimum Static Deflection		Minimum Static Deflection		Minimum Static Deflection		Minimum Static Deflection	
Type of Equipment	Type	Inch	Type	Inch	Type I Inch		Type	Inch
Air Handling Units								
Floor mounted inside unit through 5 HP	S-Z	0.35	S-Z	1.00	S-Z	0.75	S-Z	0.75
Floor mounted inside unit 7-1/2 HP through 20 through 400 rpm	S-Z	1.00	S-Z	1.5	S-Z	2.5	S-Z	2.5
Floor mounted inside unit 7-1/2 HP through 20 HP 401 rpm and over	S-Z	1.00	S-A	1.5	S-A	2.5	S-Z	2.5
Floor mounted inside unit 25 HP and larger 401 rpm and over	S-Z	1.00	S-Z	1.5	S-Z	2.5	S-Z	2.5
Suspended (except internally isolated)	H	0.5	H	1.0	H	1.0	H	1.0

1. Piping Connected to Rotating or Reciprocating Equipment: Use flexible piping connections.

2. Horizontal Pipe Isolation: Provide Type HP hangers or Type SS mounts with deflections equal to the equipment isolation deflection at the first 3 support locations from the equipment. Provide Type H hangers for piping within mechanical rooms or penthouses.

3. Vertical Pipe Risers Greater Than 30 feet-0 inches in height: Use Type BBS hangers at the top of the riser and type AG with pipe clamps at intermediate points.

4. Ductwork in Mechanical Equipment Rooms: Use Type W hanger with 0.75 inch minimum deflection for all ducts with a cross-sectional area of 2.0 square feet or over.

3.02 BLOWER MINIMUM DEFLECTION GUIDE

Fan Speed (rpm)	On Grade	20' Floor Span	30' Floor Span	40' Floor Span
175-224	0.35	3.5	4.5	4.5
225-299	0.35	3.5	3.5	3.5
300-374	0.35	2.5	2.5	3.5
375-499	0.35	1.5	*2.5*	*3.5*
500 and over	0.35	1.00	1.5	2.5

3.03 INSTALLATION

A. Install and adjust vibration isolation devices and flexible pipe connectors in accordance with manufacturer's instructions.

B. Coordinate with actual equipment supplier for final dimensional data, total operating weight, corner weight, center of gravity to properly size and select vibration isolators.

C. No metal to metal contact will be permitted between fixed and floating parts. Provide pads, washers and bushing to avoid metal to metal contact.

D. Install flexible pipe connections at right angles to displacement and on equipment side of shut-off valves.

E. Do not install any rotating mechanical equipment, associated piping, ductwork, etc., which makes rigid contact with the structure unless it is approved by the Architect. Structure includes slabs, beams, studs, walls, columns, lath, etc.

F. Coordinate work with other trades to avoid rigid contact with the building. Inform other trades that follow, such as plastering or electrical, to avoid any contact which would reduce the efficiency of vibration isolation systems.

G. Connections to Equipment: Allow for deflections equal to or greater than equipment deflections. Electrical, drain, piping connections, and other items

made to rotating or reciprocating equipment (pumps, compressors, etc.) which rests on vibration isolators, shall be isolated from building structure for he first three hangers or supports.

H. Extend bases for pipe elbows supports at discharge and suction connections at pumps. Pipe elbow supports shall not short circuit pump vibration to structure.

I. Conflicts with other trades which will result in unavoidable contact with equipment, piping, etc., described herein, due to inadequate space, etc., shall be brought to the Architect's attention prior to installation. Corrective work necessitated by conflicts after installation shall be at the responsible contractor's expense.

J. Inspection and Adjustments: Check vibration and noise transmission through connections, piping, ductwork, foundations, and walls. Adjust, repair or replace isolators as required to reduce vibration and noise transmission to specified levels.

K. Install flexible pipe connectors at all equipment to allow seismic movement to allow seismic movement of the pipe relative to the piece of equipment, including constant volume air terminals, fan-coil units and duct mounted coils.

END OF SECTION

SECTION 15260 - PIPING INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes insulation types and thicknesses for piping and equipment application.

1.02 REFERENCES

A. Commercial and Industrial Insulation Standards, published by Western Insulation Contractors Association (WICA, latest edition).

B. Applicator: Company specializing in piping insulation application with three years minimum experience.

C. When tested in accordance with UBC Standard No. 42-I, flamespread rating of insulation materials shall not exceed 25; smoke density shall not exceed 50 per CMC Section 1002(b) and Section 1005.

D. Materials used in fire-rated assemblies shall bear the UL (or other approved testing laboratory) Classification marking.

1.03 SUBMITTALS

A. Submit shop drawings and samples in accordance with Division 01.

B. Submit complete data of materials proposed. Indicate individual service thicknesses.

C. Submit manufacturer’s installation instructions.

1.04 JOB CONDITIONS

A. Deliver material to Job Site in original non-broken factory packaging, labeled with manufacturer’s density.

B. Perform work at ambient and equivalent temperatures as recommended by adhesive manufacturer.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Armstrong

B. Certainteed

C. Manville

D. Knauf

E. Owens-Corning

2.02 GENERAL

A. Provide Adhesives and Insulation Materials and Covers which:

1. UL Listed

2. Have a composite fire and smoke hazard rating maximum of 25 for flame spread and 50 for smoke developed per ASTM E 84.

3. Are waterproof.

B. Lagging: 0.016 inch thick smooth aluminum sheet, with we-molded 2-piece aluminum fitting covers.

2.03 MATERIALS

A. Cold Piping (below 60 degrees F): Cover with heavy density glass fiber insulation, having factory-applied, self-sealing vapor barrier all-service jacket, molded to conform to piping, K-value at 75 degrees F, maximum 0.23 Btu-in/hr-sq ft degrees F.

B. Hot Piping: Cover with heavy density glass fiber insulation, having factory-applied, self-sealing all-service jacket, molded to conform to piping, K-value at 75 degrees F, maximum 0.23 Btu-in/hr-sq ft degrees F.

C. Refrigerant Piping and Condensate Drain Pans: Cover with foamed plastic of closed cell structure, K-value at 75 degrees F, maximum 0.28 Btu-in/hr-sq ft degrees F and a maximum water vapor transmission rating of 0.1 perms. Armstrong Armaflex or Imcolock.

D. Cold Equipment: Cover with rigid glass fiber insulation board, having factory-applied, vapor barrier all-service jacket, K-value at 75 degrees F, maximum 0.23 Btu-in/hr-sq ft degrees F, 6 pcf density.

E. Fittings and Valves: Pre-molded PVC covers installed over pre-formed insulation having same K-value as adjacent material.

PART 3 - EXECUTION

3.01 PREPARATION

A. Do not install covering before piping and equipment have been tested and proven leak tight.

B. Ensure surface is clean and thy prior to installation. Ensure insulation is dry before and during application.

C. Coordinate with pipe supports and seismic bracing.

3.02 INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.

B. Provide equivalent thickness insulation on all fittings, expansion loops, flanges, strainers, and valves and finish with pre-molded PVC fitting covers. Provide removable insulation plugs to gain access to balancing devices, test plugs, etc. Maintain vapor barrier integrity and install in accordance with manufacturer's instructions.

C. Finish insulation neatly at hangers, supports and other protrusions. Refer to Section 15062 Hangers and Supports for HVAC Piping and Equipment.

D. Locate cover seams on insulation in least visible locations.

E. Do not insulate flexible connections, expansion joints, and seismic joints except on chilled water systems.

F. Terminate insulation neatly with mastic troweled on bevel.

G. Cover cold piping fittings and valves with equivalent thickness of insulation material.

1. Seal lap joints with 100 percent coverage of vapor barrier and adhesive.

2. Seal butt joints with 4-inch wide strips of vapor barrier sealed with vapor barrier adhesive. Cover unions, flanges, couplings, valves, etc., with pre-molded insulated PVC fining covers.

H. Cover hot pipe fittings and valves up to bonnets with equivalent thickness of insulation material. Cover unions, flanges, couplings, valves, etc., with pre-molded insulated PVC fining covers.

I. Cover refrigerant piping, fittings, and valves up to bonnets with equivalent thickness of insulation material.

1. Apply with edges tightly butted.

2. Seal joints with vapor barrier sealer.

J. Equipment shall have insulation applied with edges tightly butted, joints staggered and secured in place by steel bands.

1. Where necessary, provide suitable pin anchors welded in place.

2. Provide sufficient clearance around openings for normal operation of equipment.

3. Finish hot surface insulation with 1 inch galvanized hexagonal mesh and coat with hydraulic setting insulation cement.

4. Finish cold surface insulation joints with 4 inch wide strips of vapor barrier tape sealed with vapor barrier adhesive.

5. Finish insulation with heavy coat of Childers CP1O/1 1 vapor barrier mastic applied over entire outer surface.

K. Repair separation of joints and cracking of insulation caused by thermal movement or poor workmanship.

L. Where insulation requires sealing and taping, complete required procedures at the same time insulating material is applied to assure clean surfaces exist for proper adhesion.

M. Cinch staples shall be permitted only in accordance with insulation installation instructions. Cover all staples with vapor barrier mastic.

N. Insulate all chilled water system appurtenances so that no condensation forms, i.e., drain lines, sensing lines, thermometer stems, etc.

O. Cover insulated outdoor piping systems with aluminum lagging.

P. Where supports, bracing or anchor is in direct contact with the pipe, supports, bracing or anchor shall be insulated 3-feet beyond the piping.

3.03 PIPING INSULATION THICKNESS SCHEDULE

Piping Type	Runout, Sizes to 2" (Note 1)	Branches, Mains, Loops in Size (Note 2)				
		0"-1"	1-1/4"-2"	2-1/2"-4"	5"-6"	8"-up
Domestic hot water and hot water return	1/2"	1"	1"	1"	1"	1"
Condensate return	1"	1"	1-1/2"	2"	2"	2"
Pumped condensate return	1"	1"	1-1/2"	2"	2"	2"
Chilled, indoors	1-1/2"	1-1/2"	1-½"	1-½"	1-½"	1-1/2"
Chilled, outdoors	1-1/2"	1-1/2"	1-1/2"	1-1/2"	1-1/2"	1-1/2"
Refrigerant suction/liquid piping	1"	1"	1-1/2"	1-1/2"	1-1/2"	1-1/2"

Notes:
1) "Runouts" are piping that is 12'-0" inches long or less, and that is connected to fixtures or individual terminal units.
2) "Branches, Mains, and Loops" are circulating piping and piping that is over 12'-0" long and that is connected to fixtures or individual terminal units.

END OF SECTION

SECTION 15290 - DUCTWORK INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes insulation types and thicknesses for duct and equipment application.

1.02 REFERENCES

A. Commercial and Industrial Insulation Standards, published by Western Insulation Contractors Association (WICA, latest edition).

B. Applicator: Company specializing in duct insulation application with three years minimum experience.

C. When tested in accordance with UBC Standard No. 42-I, flamespread rating of insulation materials shall not exceed 25; smoke density shall not exceed 50 per CMC Section 1002(b) and Section 1005.

D. Materials used in fire-rated assemblies shall bear the UL (or other approved testing laboratory) Classification marking.

1.03 SUBMITTALS

A. Submit shop drawings and samples in accordance with Division 01.

B. Submit complete data of materials proposed. Indicate individual service thicknesses.

C. Submit manufacturer’s installation instructions.

1.04 JOB CONDITIONS

A. Deliver material to Job Site in original non-broken factory packaging, labeled with manufacturer’s density.

B. Perform work at ambient and equivalent temperatures as recommended by adhesive manufacturer.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Armstrong

B. Certainteed

C. Manville

D. Knauf

E. Owens-Corning

2.02 GENERAL

A. Provide Adhesives and Insulation Materials and Covers which:

1. UL Listed

2. Have a composite fire and smoke hazard rating maximum of 25 for flame spread and 50 for smoke developed per ASTM E 84.

3. Are waterproof.

B. Lagging: 0.016 inch thick smooth aluminum sheet, with we-molded 2-piece aluminum fitting covers.

2.03 MATERIALS

A. Rigid Insulation. Calculate the minimum thickness in accordance with ASHRAE 90.1 - SI.

B. Blanket Insulation. Calculate minimum thickness in accordance with ASHRAE 90.1 - SI.

C. All-Purpose Jacket. Provide insulation with insulation manufacturer's standard reinforced fire-retardant jacket with or without integral vapor barrier.

D. Cold Equipment: Cover with rigid glass fiber insulation board, having factory-applied, vapor barrier all-service jacket, K-value at 75 degrees F, maximum 0.23 Btu-in/hr-sq ft degrees F, 6 pcf density.

E. Fittings and Valves: Pre-molded PVC covers installed over pre-formed insulation having same K-value as adjacent material.

PART 3 - EXECUTION

3.01 PREPARATION

A. Do not install covering before duct and equipment have been tested and proven leak tight.

B. Ensure surface is clean and dry prior to installation. Ensure insulation is dry before and during application.

C. Coordinate with duct supports and seismic bracing.

3.02 INSTALLATION

A. Install insulation in accordance with manufacturer’s instructions.

B. Provide equivalent thickness insulation on all fittings, flexible connections, expansion joints, seismic joints and dampers. Provide removable insulation plugs to gain access to balancing devices, test plugs, etc. Maintain vapor barrier integrity and install in accordance with manufacturer's instructions.

C. Finish insulation neatly at hangers, supports and other protrusions. Refer to Section 15062 Hangers and Supports for HVAC Piping and Equipment.

D. Locate cover seams on insulation in least visible locations.

E. Where ducts pass through fire walls, fire partitions, above grade floors, and fire rated chase walls, the penetration shall be sealed with fire stopping materials. The protection of ducts at point of passage through firewalls must be in accordance with NFPA 90A and/or NFPA 90B.

F. Terminate insulation neatly with mastic troweled on bevel.

G. Duct insulation minimum thickness shall be 2" or higher as calculated per ASHRAE-90.1 for Supply Air ducts and 1.5" for Return Air and Outside Air ducts.

   1. Seal lap joints with 100 percent coverage of vapor barrier and adhesive.

   2. Seal butt joints with 4-inch wide strips of vapor barrier sealed with vapor barrier adhesive. Cover unions, flanges, couplings, valves, etc., with pre-molded insulated PVC fining covers.

H. Insulation and vapor retarder/vapor barrier shall be provided for Supply and Return air ducts and associated equipment.

I. Equipment shall have insulation applied with edges tightly butted, joints staggered and secured in place by steel bands.

   1. Where necessary, provide suitable pin anchors welded in place.

   2. Provide sufficient clearance around openings for normal operation of equipment.

   3. Finish hot surface insulation with 1 inch galvanized hexagonal mesh and coat with hydraulic setting insulation cement.

   4. Finish cold surface insulation joints with 4 inch wide strips of vapor barrier tape sealed with vapor barrier adhesive.

   5. Finish insulation with heavy coat of Childers CP1O/1 1 vapor barrier mastic applied over entire outer surface.

J. Repair separation of joints and cracking of insulation caused by thermal movement or poor workmanship.

K. Where insulation requires sealing and taping, complete required procedures at the same time insulating material is applied to assure clean surfaces exist for proper adhesion.

L. Cinch staples shall be permitted only in accordance with insulation installation instructions. Cover all staples with vapor barrier mastic.

M. Insulate all duct appurtenances so that no condensation forms, i.e., drain lines, sensing lines, thermometer stems, etc.

N. Where supports, bracing or anchor is in direct contact with the duct, supports, bracing or anchor shall be insulated 3-feet beyond the duct.

END OF SECTION

SECTION 15440 - PLUMBING FIXTURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section includes the following conventional plumbing fixtures and related components:

1. Faucets for lavatories and sinks.
2. Fixture supports.
3. Water closets.
4. Lavatories.
5. Sinks.

1.02 RELATED WORK OF OTHER SECTIONS

A. Division 0-Bidding & Contract Forms, and Division 1, General Requirements, govern the work of this section.

1.03 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

C. Cast Polymer: Cast-filled-polymer-plastic material. This material includes cultured-marble and solid-surface materials.

D. Cultured Marble: Cast-filled-polymer-plastic material with surface coating.

E. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

F. FRP: Fiberglass-reinforced plastic.

G. PMMA: Polymethyl methacrylate (acrylic) plastic.

H. PVC: Polyvinyl chloride plastic.

I. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

1.04 SUBMITTALS

A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

B. Shop Drawings: Diagram power, signal, and control wiring, structural beam scan result

C. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.

D. Warranty: Special warranty specified in this Section.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

D. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

E. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

F. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

G. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Stainless-Steel Commercial, Handwash Sinks: NSF 2 construction.

2. Stainless-Steel Residential Sinks: ASME A112.19.3.

3. Vitreous-China Fixtures: ASME A112.19.2M.

4. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.

H. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:

1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.

2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.

3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.

4. Faucets: ASME A112.18.1.

5. Hose-Connection Vacuum Breakers: ASSE 1011.

6. Hose-Coupling Threads: ASME B1.20.7.

7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.

8. NSF Potable-Water Materials: NSF 61.

9. Pipe Threads: ASME B1.20.1.

10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.

11. Supply Fittings: ASME A112.18.1.

12. Brass Waste Fittings: ASME A112.18.2.

I. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Atmospheric Vacuum Breakers: ASSE 1001.

2. Brass and Copper Supplies: ASME A112.18.1.

3. Plastic Tubular Fittings: ASTM F 409.

4. Brass Waste Fittings: ASME A112.18.2.

J. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Disposers: ASSE 1008 and UL 430.

2. Flexible Water Connectors: ASME A112.18.6.

3. Floor Drains: ASME A112.6.3.

4. Grab Bars: ASTM F 446.

5. Hose-Coupling Threads: ASME B1.20.7.

6. Off-Floor Fixture Supports: ASME A112.6.1M.

7. Pipe Threads: ASME B1.20.1.

8. Plastic Toilet Seats: ANSI Z124.5.

1.06 EXTRA MATERIALS

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

1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.

2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

3. Provide hinged-top wood or metal box, or individual metal boxes, with separate compartments for each type and size of extra materials listed above.

4. Toilet Seats: Equal to 5 percent of amount of each type installed.

PART 2 - PRODUCTS

2.01 LAVATORY FAUCETS

A. Lavatory Faucets:

1. Manufacturers: See Schedule on drawings

2. Description: Two-handle mixing valve. Include hot- and cold-water indicators; single hole faucet; coordinate outlet with spout and fixture receptor. Refer to plumbing schedule.

a. Body Material: Commercial, solid brass

b. Finish: Polished chrome plate.

c. Maximum Flow Rate: 1.5 gpm

d. Mounting: Deck, exposed.

e. Valve Handle(s): Wrist blade, 4 inches

f. Inlet(s): NPS 1/2 (DN 15) male shank.

g. Spout: Rigid, gooseneck type.

h. Spout Outlet: Aerator.

i. Operation: Compression, manual.

j. Drain: Not required.

k. Tempering Device: Thermostatic

2.02 SINK FAUCETS

A. Sink Faucets:

1. Manufacturers: See Schedule on drawings

2. Description: Two-handle sink faucet. Include hot- and cold-water indicators; single hole; coordinate outlet with spout and fixture receptor. Refer to plumbing schedule.

a. Body Material: Commercial, solid brass.

b. Finish: Polished chrome plate.

c. Maximum Flow Rate: 1.5 gpm, unless otherwise indicated.

d. Mixing Valve: Two-lever handle.

e. Mounting: Deck, exposed.

f. Valve Handle(s): Wrist blade, 4 inches

g. Inlet(s): NPS 1/2 (DN 15) female shank.

h. Spout: Swivel, gooseneck type.

i. Spout Outlet: Aerator.

j. Operation: Compression, manual.

k. Drain: Not required

2.03 FIXTURE SUPPORTS

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

1. American Standard Companies, Inc.

B. Lavatory Supports:

1. Description: Type II, lavatory carrier with concealed arms and tie rod for wall-mounting, lavatory-type fixture.

2.04 WATER CLOSETS

A. Water Closets:

1. Manufacturers: See Schedule on drawings

2. Description: Accessible, floor-mounting, floor-outlet, vitreous-china fixture designed for flushometer valve operation. Refer to plumbing schedule.

a. Supply: NPS 1 (DN 25) chrome-plated brass.

b. Style: Flushometer valve.

1) Bowl Type: Elongated with siphon-jet design. Include bolt caps matching fixture.

2) Height: Accessible.

3) Design Consumption: 1.28 gal./flush.

4) Color: White.

c. Flushometer: Manual flush valve.

d. Toilet Seat: Heavy duty open front without cover.

2.05 LAVATORIES

A. Lavatories:

1. Manufacturers: See Schedule on drawings.

2. Description: Accessible, wall-mounting, vitreous-china fixture. Refer to plumbing schedule.

a. Type: With back.

b. Size: 20 by 18 inches (508 by 457 mm) rectangular. 6-1/2” Deep.

c. Faucet Hole Punching: Single Hole.

d. Faucet Hole Location: Top.

e. Pedestal: Not required.

f. Color: White.

g. Faucet: Lavatory for separate drain.

h. Supplies: NPS 3/8 (DN 10) chrome-plated copper with stops.

i. Drain: Grid with offset waste.

1) Location: Near back of bowl.

j. Drain Piping: NPS 1-1/4 by NPS 1-1/2 (DN 32 by DN 40) chrome-plated, cast-brass P-trap; NPS 1-1/2 (DN 40), 0.045-inch- (1.1-mm-) thick tubular brass waste to wall; and wall escutcheon.

1) Exception: Omit P-trap if hair interceptor is required.

k. Hair Interceptor: Not required

l. Fixture Support: Lavatory wall hanger.

2.06 SINKS

A. Sinks:

1. Manufacturers: See Schedule on drawings

2. Description: Accessible, counter mounted, stainless-steel sink.

a. Overall Dimensions: 25 by 22 x 7 inches.

b. Metal Thickness: 22 gauge.

c. Sink Faucet: See Section for “Sink Faucets.”

d. Supplies: NPS 1/2 (DN 15) chrome-plated copper with stops.

e. Drain Piping: NPS 1-1/2 (DN 40) chrome-plated, cast-brass P-trap; 0.045-inch- (1.1-mm-) thick tubular brass waste to wall; continuous waste; and wall escutcheon(s).

f. Dishwasher Air-Gap Fitting: Not required.

g. Hot-Water Dispenser: Not required.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.

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

3.02 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.

2. Use carrier supports without waste fitting for fixtures with tubular waste piping.

3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install wall-mounting fixtures with tubular waste piping attached to supports.

D. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

E. Install counter-mounting fixtures in and attached to casework.

F. Install fixtures level and plumb according to roughing-in drawings.

G. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture. Valves are specified in Specification Section 15111 General-Duty Valves for HVAC Piping

H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

I. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

J. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

K. Install toilet seats on water closets.

L. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

M. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.

N. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

O. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.

2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

P. Install disposer in outlet of each sink indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.

Q. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings.

R. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

3.03 CONNECTIONS

A. Piping installation requirements are specified in other Specification Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

C. Ground equipment according to Division 16.

D. Connect wiring according to Division 16.

3.04 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

E. Install fresh batteries in sensor-operated mechanisms.

3.05 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Operate and adjust disposers. Replace damaged and malfunctioning units.

C. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

D. Replace washers and seals of leaking and dripping faucets and stops.

E. Install fresh batteries in sensor-operated mechanisms.

3.06 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.

2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.07 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner's Representative.

END OF SECTION

SECTION 15850 - AIR HANDLING

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes design of factory fabricated outdoor rated air handling units and components required.

1.02 SUBMITTALS

A. Comply with provisions of Division 1.

B. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements. Computer generated fan curves for each air handling unit shall be submitted with specific design operating point noted. A computer-generated psychometric chart shall be submitted for each cooling coil with design points and final operating point clearly noted. Sound data for discharge, radiated and return positions shall be submitted by octave band for each unit. Calculations for required base rail heights to satisfy condensate trapping requirements of cooling coil shall be included.

C. Product Data:

1. Provide literature that indicates dimensions, weights, capacities, ratings, fan performance, finishes of materials, electrical characteristics, and connection requirements.

2. Provide data of filter media, filter performance data, filter assembly, and filter frames.

3. Provide manufacturer's installation instructions.

1.03 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Air Handler products specified in this section must show a minimum five years documented experience and complete catalog data on total product.

1.04 SAFETY AGENCY LISTED & CERTIFICATION

A. Air Handling units shall be cETLus safety listed to conform with UL Standard 1995 and CAN/CSA Standard C22.2 No. 236. Units shall be accepted for use in New York City by the Department of Building, MEA 342-99-E.

B. Air handler furnished with double width, double inlet (DWDI) fans and/or plenum fans where applicable, shall be certified in accordance with the central station air handling units certification program, which is based on AHRI Standard 430. (NOTE: Above does not apply to fan array)

C. Air handling unit water heating & cooling coils shall be certified in accordance with the forced circulation air cooling and air heating coils certification program, which is based on AHRI Standard 410.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site.

B. Accept products on site on factory-furnished shipping skids. Inspect for damage.

C. Store in clean dry place and protect from construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. The following manufacturers are approved for use. No substitutions will be permitted.

1. Huntair

2. Trane

3. Carrier

2.02 GENERAL DESCRIPTION

A. Configuration: Fabricate as detailed on drawings.

B. Performance: Conform to AHRI 430. See schedules on prints.

C. Acoustics: Sound power levels (dB) for the unit shall not exceed the specified levels shown on the unit schedule. The manufacturer shall provide the necessary sound treatment to meet these levels if required.

2.03 UNIT CONSTRUCTION

A. Fabricate unit with heavy gauge channel posts and panels secured with mechanical fasteners. All panels, access doors, and ship sections shall be sealed with permanently applied bulb-type gasket. Shipped loose gasketing is not allowed.

B. Panels and access doors shall be constructed as a 2-inch nominal thick; thermal broke double wall assembly, injected with foam insulation with an R-value of not less than R-13.

1. The outer panel shall be constructed of G60 painted galvanized steel.

2. The outer panel shall be constructed of G60 painted galvanized 18-gauge steel.

3. The inner liner shall be constructed of G90 galvanized steel.

4. The floor plate shall be constructed as specified for the inner liner.

C. Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, maximum 5 inches of positive or 6 inches of negative static pressure. Deflection shall be measured at the panel midpoint.

D. The casing leakage rate shall not exceed .5 cfm per square foot of cabinet area at 5 inches of positive static pressure or 6 inches of negative static pressure (.0025 m3/s per square meter of cabinet area at 1.24 kPa static pressure).

E. Module to module field assembly shall be accomplished with an overlapping, full perimeter internal splice joint that is sealed with bulb type gasketing on both mating modules to minimize on-site labor and meet indoor air quality standards.

F. Access doors shall be flush mounted to cabinetry, with minimum of two six inch long stainless steel piano-type hinges, latch and full size handle assembly. Access doors shall swing outward for unit sections under negative pressure. Access doors on positive pressure sections, shall have a secondary latch to relieve pressure and prevent injury upon access.

G. Construct drain pans from stainless steel with cross break and double sloping pitch to drain connection. Provide drain pans under cooling coil section. Drain connection centerline shall be a minimum of 3'' above the base rail to aid in proper condensate trapping. Drain connections that protrude from the base rail are not acceptable. There must be a full 2'' thickness of insulation under drain pan.

H. A glass window for viewing, capable of withstanding unit operating pressures, shall be provided in the door.

2.04 FAN ASSEMBLIES for Centrifugal Fan unit (see equipment schedule)

A. Acceptable fan assembly shall be a double width, double inlet, class I, belt-drive type housed forward curved fan dynamically balanced as an assembly, as shown in schedule. Maximum fan RPM shall be below first critical fan speed. Fan assemblies shall be dynamically balanced by the manufacturer on all three planes and at all bearing supports. Copper lubrication lines shall be provided and extend from the bearings and attached with grease fittings to the fan base assembly near access door. If not supplied at the factory, contractor shall mount copper lube lines in the field. Fan and motor shall be mounted internally on a steel base. Provide access to motor, drive, and bearings through hinged access door.

B. Acceptable fan assembly shall be a double width, double inlet, class II, belt-drive type housed forward curved fan dynamically balanced as an assembly,

as shown in schedule. Maximum fan RPM shall be below first critical fan speed. Fan assemblies shall be dynamically balanced by the manufacturer on all three planes and at all bearing supports. Copper lubrication lines shall be provided and extend from the bearings and attached with grease fittings to the fan base assembly near access door. If not supplied at the factory, contractor shall mount copper lube lines in the field. Fan and motor shall be mounted internally on a steel base. Provide access to motor, drive, and bearings through hinged access door.

C. Fan and motor shall be mounted internally on a steel base. Factory mount motor on slide base that can be slid out the side of the unit if removal is required. Provide access to motor, drive, and bearings through hinged access door. Fan and motor assembly shall be mounted on rubber-in-shear vibration type isolators inside cabinetry.

D. Fan and motor shall be mounted internally on a steel base. Factory mount motor on slide base that can be slid out the side of the unit if removal is required. Provide access to motor, drive, and bearings through hinged access door. Fan and motor assembly shall be mounted on 2" deflection spring vibration type isolators inside cabinetry.

2.05 FAN ASSEMBLIES for units with multiple Fans (see equipment schedule for the units requiring multiple fans)

A. Fans

1. Fans shall be aluminum airfoil, Class III, direct drive arrangement and shall be individually housed. Fans shall be certified by AMCA for performance. Fan shall be housed in a “cell”.

2. Fan housing or “cell” shall be constructed of aluminum or stainless steel with perforated inner liner, melamine insulation, with either solid or perforated outer panels as required by applications.

3. Fan/motor shall be mounted within the housing on an adjustable slide rail base. Fan/motor assembly must be capable of either horizontal or vertical application.

4. Each fan/motor assembly shall be dynamically balanced to meet AMCA standard 204-96, for fan application class BV-5, to meet or exceed a rotational imbalance Grade .55, producing a maximum rotational imbalance of .022” per second peak, filter in (.55mm per second peak, filter in). “Filter in” measurement indicates that the specified balance grade must be achieved at the submitted design operating speed for the fan(s). Fan and motor assemblies submitted for approval incorporating larger that 215T frame shall be balanced in three orthogonal planes to demonstrate compliance with the G.55 requirement with a maximum rotational imbalance of .022” per second peak filter in (.55 mm per second peak, filter in).

5. Fan and motor assemblies shall be designed for application in multiple fan arrays.

B. Fan Backdraft Dampers

1. Each fan applied in multiple fan applications shall be provided with an integral back flow prevention device that prohibits recirculation of air in the event a fan, or multiple fans, become disabled. The system effect for the submitted back flow prevention device shall be included in the calculation to determine the fan TSP for fan selection purposes, and shall be indicated as a separate line item SP loss in the submitted fan selection data. Manufacturers other than the basis of design being submitted must provide independent lab certification of fan testing that indicates the system effects attributed to the submitted back flow prevention device in the submitted close coupled mounting arrangement at the inlet of the fan. Fans submitted with discharge dampers will not be approved.

2. Back Draft Damper performance data that is based on an AMCA ducted inlet and ducted discharge mounting configuration will not be accepted. Submitted Back flow prevention device data must be reflective of close coupled mounting at the intake of the fan(s) per the project design documents. Motorized dampers or other motorized devices submitted for back flow prevention are not acceptable.

3. AHU Manufacturers that do not manufacture the fans being submitted must provide tested and certified performance data for fans as installed in the AHU unit including the back draft damper system effects introduced by close coupled back draft dampers at the fan inlet.

C. Fan Airflow Monitoring: Fans shall have non-invasive, zero pressure drop flow a/o pressure sensing taps installed in the fan inlet cone for airflow monitoring capability as specified.

D. Motors

1. All motors shall be standard foot mounted type, TEFC or TEAO motors selected at the specified operating voltage, RPM, and efficiency as specified or as scheduled elsewhere.

2. Motors shall meet the requirements of NEMA MG-1 Part 30 and 31, section 4.4.2.

3. Motors shall be manufactured by Baldor, Siemens or Toshiba. Motors shall be available in ½ HP increments as nameplate HP ratings from 1.5 HP through 12 HP.

E. Multiple Fan Arrays

1. The fan array shall consist of multiple housed fans or “cells”, spaced in the air way tunnel cross section to provide a uniform air flow and velocity profile across the entire air tunnel cross section and components therein.

2. Each fan and motor assembly shall be removable through a 24” wide, free area, access door located on the discharge side of the fan wall array without removing the fan wheel from the motor.

3. All fans in multiple fan arrays shall be AMCA certified for performance per AMCA arrangement “A” testing configuration. The submitted fan performance shall be inclusive of system effects attributed to the fan mounting arrangement, fan enclosures, back draft dampers, and other fan appurtenances not considered when AMCA certified performance per AMCA arr. “A” is determined. Submitted AHU/fan performance that does not indicate allowances for system effects for the back flow prevention device(s), wheel enclosures, safety screens, bearing pedestals, belt guards, or the fan and motor enclosure in which each fan is mounted, will be returned to the contractor disapproved and will need to be resubmitted with all of the requested information included for approval. Added system effects for acoustic attenuators, or other devices required to met specified fan performance and sound power levels must be indicated in the submitted fan selection data.

4. Fan system power requirements or sound power levels that fail to meet specified performance levels shall be corrected to meet specified performance levels at no additional cost to the owner. Any proposed corrections for power or sound deviations from the specified values must be submitted to the engineer for approval prior to implementation of any proposed corrective procedure.

5. Submittals for units providing less that the scheduled quantity of fans and/or spacing of fans for multiple fan arrays shall submit CFD modeling of the air flow profile for approval that indicates uniform velocity and flow across all internal components without increasing the length of the unit or changing the aspect ratio of the unit casing as designed.

6. Manufacturers that do not manufacture their own fans for the specific purpose of use in multiple fan arrays, shall provide a letter guaranteeing submitted AHU performance for flow, pressure, and acoustics at the perimeter boundary of the unit signed by an officer of the OEM fan manufacturer being submitted. Any corrective acoustical treatment, added airway tunnel lengths, increased electrical service, and any structural modifications necessary to meet the specified and scheduled performance shall be provided at no additional cost to the owner to meet the specified performance criteria. All proposed corrective actions, when required, must be submitted for approval and shall include a guarantee of performance, as listed above, at no additional cost to the owner.

7. It shall be the option to have the airflow performance tested. All tests shall be in accordance with AMCA Standard 210: Laboratory Methods for Testing Fans for Rating and AMCA Standard 203-90: Field Performance Measurement of Fan Systems.

F. Acoustical Performance

1. The AHU unit shall provide the specified acoustical performance as scheduled for the unit supply discharge opening(s), RA opening(s), and the Outside air and Exhaust air opening(s).

2. Coplanar silencer(s) and/or sound attenuator(s) shall be provided to meet specified acoustical requirements. Sound attenuator cross sectional area

shall be selected to not exceed 500 fpm. Losses from sound attenuating devices must be included in the fan performance selection.

3. Listed or alternate manufacturers, other than basis of design, providing fan arrays that incorporate fans which are not manufactured by the AHU manufacturer, must provide modeled acoustical performance of the AHU unit.

4. Sound and performance data for approval showing only single fan performance for multiple fan array supplication will be returned without review.

5. Any proposed remedy for deviations in submitted sound power levels shall be approved by a registered acoustical consultant as selected by the owner or architect. Costs for review of the proposed changes shall be borne by the contractor.

G. Electrical

1. Provide a complete electrical and control system required to run the multiple fan sections as a single system including all equipment, material, electrical enclosures, electrical components and electrical labor. Electrical designs shall be in accordance with the NEC, UL 508A and local codes.

2. All motors in the system shall be provided with individual Motor Protection for thermal overload protection. All motor circuit protectors shall be located in main enclosure.

3. Provide a single Variable Frequency Drive to start and run all motors in the FANWALL array. The Variable Frequency Drive shall be sized accordingly to start and hold all motors in the FANWALL. Optional short circuit protection through means of using fuses with fuse block disconnects or other means of protection.

4. The Variable Frequency Drive shall be mounted in a dedicated enclosure for connection to the single point power. Variable Frequency Drive enclosure shall be provided with a main disconnecting means. Provide appropriate cooling of the enclosure.

5. Motor circuit protectors shall be used for each motor in the FANWALL array. Motor circuit protectors shall be housed and mounted in the VFD enclosure as required. Motor circuit protectors may be mounted in a remote enclosure that is separate from the VFD enclosure if design requires. Variable Frequency Drive enclosure and remote Motor circuit protector enclosure must be mounted at a minimal distance from fan array motors and each other.

6. Provide one Variable Frequency Drive for normal operation and a three contactor By-pass circuitry configuration for across the line By-pass operation. Provide control wiring and control circuitry to transfer from main VFD to By-pass operation when main drive has faulted. The By-pass contactor and the Variable Frequency Drive shall be sized

accordingly to start and hold all motors in the fan system. Optional short circuit protection for drive and By-pass contactor through means of using fused disconnects or other means of protection.

7. Provide a Programmable Logic Controller (PLC) to control all functions of the fan system. The Programmable Logic Controller system will be designed and programmed to control Auto and Manual Functions, provide CFM totalizing, CFM control, By-pass operation, control redundant drive operation and all functions required by the FANWALL system. Provide Operator Interface Unit for communication with PLC.

8. The Programmable Logic Controller, Variable Frequency Drive, By-pass contactors and all other PLC related equipment shall be mounted in a dedicated enclosure for connection to single point power. The enclosure shall be provided with a main disconnecting means. Provide appropriate cooling of the enclosure.

9. PLC controller shall be completely compatible with Bacnet protocol.

10. when using variable frequency drives provide either a shaft grounding system or Isolated bearings for each AC motor to prevent electrical damage to motor bearings and extend motor life by safely channeling harmful shaft currents to ground.

11. when using variable frequency drives provide input Line Reactors with three percent impedance externally if not already internal to the variable frequency drive. when using variable frequency drives where distance and filtering is an issue, provide output line reactors as required. Size output filter accordingly to manufacturer's recommendations.

2.06 BEARINGS, SHAFTS, AND DRIVES

A. Bearings: Basic load rating computed in accordance with AFBMA - ANSI Standards. The bearings shall be designed for service with an L-50 life of 200,000 hours and shall be a heavy-duty pillow block, self-aligning, grease-lubricated ball or spherical roller bearing type.

B. Shafts shall be solid, hot rolled steel, ground and polished, keyed to shaft, and protectively coated with lubricating oil. Hollow shafts are not acceptable.

C. V-Belt drives shall be cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Fixed sheaves, matched belts, and drive rated based on motor horsepower. Minimum of 2 belts shall be provided on all fans with 10 HP motors and above. Standard drive service factor minimum shall be 1.1 S.F. for 1/4 HP – 7.5 HP, 1.3 S.F. for 10 HP and larger, calculated based on fan brake horsepower.

2.07 ELECTRICAL

A. Fan motors shall be manufacturer provided and installed, Open Drip Proof, premium efficiency (meets or exceeds EPAct requirements), 1750 RPM, single speed, 460V / 60HZ / 3P or as specified in drawing. Complete electrical characteristics for each fan motor shall be as shown in schedule.

B. The air handler(s) shall be ETL and ETL-Canada listed by Intertek Testing Services, Inc. Units shall conform to bi-national standard ANSI/UL Standard 1995/CSA Standard C22.2 No. 236.

C. Wiring Termination: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclosed terminal lugs in terminal box sized to NFPA 70.

D. Manufacturer shall provide ASHRAE 90.1 Energy Efficiency equation details for individual equipment to assist Building Engineer for calculating system compliance.

E. Installing contractor shall provide GFI receptacle within 25 feet of unit to satisfy National Electrical Code requirements.

F. All electrical connection components shall be field provided and mounted as shown on project schedule.

G. Air handler manufacturer shall provide and mount conduit and wiring from each fan motor terminated at an external junction box.

2.08 COOLING COILS

A. Certification: Acceptable water cooling coils shall be certified in accordance with AHRI Standard 410 and bear the AHRI label. Coils exceeding the scope of the manufacturer's certification and/or the range of AHRI's standard rating conditions will be considered provided the manufacturer is a current member of the AHRI Forced Circulation Air-Cooling and Air-Heating Coils certification programs and that the coils have been rated in accordance with AHRI Standard 410. Manufacturer must be ISO 9002 certified.

B. Water cooling coil shall be provided. Provide access to coil(s) for service and cleaning. Enclose coil headers and return bends fully within unit casing. Unit shall be provided with coil connections that extend a minimum of 5" beyond unit casing for ease of installation. Drain and vent connections shall be provided exterior to unit casing. Coil connections must be factory sealed with grommets on interior and exterior panel liners to minimize air leakage and condensation inside panel assembly. If not factory packaged, Contractor must supply all coil connection grommets and sleeves. Coils shall be removable through side and/or top panels of unit without the need to remove and disassemble the entire section from the unit.

1. Headers shall consist of seamless copper tubing to assure compatibility with primary surface. Headers to have intruded tube holes to provide

maximum brazing surface for tube to header joint, strength, and inherent flexibility. Header diameter should vary with fluid flow requirements.

2. Fins shall have a minimum thickness of 0.0075 -nch aluminum plate construction. Fins shall have full drawn collars to provide a continuous surface cover over the entire tube for maximum heat transfer. Fins shall be provided with factory coating – electro fins rated to withstand more 5000+ hours of salt spray. Tubes shall be mechanically expanded into the fins to provide a continuous primary to secondary compression bond over the entire finned length for maximum heat transfer rates. Bare copper tubes shall not be visible between fins.

3. Coil tubes shall be 5/8 inch OD seamless copper, 0.020 inch nominal tube wall thickness, expanded into fins, brazed at joints.

4. Coil connections shall be carbon steel, NPT threaded connection. Connection size to be determined by manufacturer based upon the most efficient coil circuiting. Vent and drain fittings shall be furnished on the connections, exterior to the air handler. Vent connections provided at the highest point to assure proper venting. Drain connections shall be provided at the lowest point to insure complete drainage and prevent freeze-up.

5. Coil casing shall be a formed channel frame of galvanized steel.

2.09 FILTERS

A. Furnish combination filter section with 2-inch no flat pre-filter or as specified in drawing. Provide side loading and removal of filters.

B. Furnish flat panel filter section with 2-inch pleated MERV 8 filter with microbial resistant Intersept coating. Provide side loading and removal of filters.

1. Filter media shall be UL 900 listed, Class I or Class II.

2. Filter Magnehelic gauge(s) shall be furnished and mounted by others.

3. Provide UV light, installed by contractor at the field, interlock with filter door.

C. If indicated in the contractor drawing, provide an additional filter section with 4” thick MERV 13 filter, side loading.

2.10 ADDITIONAL SECTIONS

A. Plenum section shall be provided and properly sized for inlet and/or discharge air flow (between 600 and 1500 feet per minute). The plenum shall provide single or multiple openings as shown on drawings and project schedule.

B. Mixing box section shall be provided with end outside air opening and no return air opening with or without parallel low leak airfoil damper blades. Dampers shall be hollow core galvanized steel airfoil blades, fully gasketed and have continuous vinyl seals between damper blades in a galvanized steel frame. Dampers shall have stainless steel jamb seals along end of dampers. Connecting linkage and ABS plastic end caps shall be provided when return and outside air dampers are each sized for full airflow. Return and outside air dampers of different sizes must be driven separately. Damper Leakage: Leakage rate shall be less than two tenths of one percent leakage at 2 inches static pressure differential. Leakage rate tested in accordance with AMCA Standard 500.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's Installation & Maintenance instructions.

3.02 ENVIRONMENTAL REQUIREMENTS

A Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

END OF SECTION

SECTION 15860 - CENTRIFUGAL FANS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes utility sets, inline centrifugal fans, roof exhaust fans for air distribution systems.

1.02 QUALITY ASSURANCE

A. AFBMA 9 – Load Ratings and Fatigue Life for Ball Bearings.

B. AFBMA 11 – Load Ratings and Fatigue Life for Roller Bearings.

C. AMCA 99 – Standards Handbook.

D. AMCA 210 – Laboratory Methods of Testing Fans for Rating Purposes.

E. AMCA 300 – Test Code for Sound Rating Air Moving Devices.

F. AMCA 301 – Method of Calculating Fan Sound Ratings from Laboratory Test Data.

G. ANSI B3.15.

H. NEMA MG1 – Motors and Generators.

I. NFPA 70 – National Electrical Code.

J. SMACNA – HVAC Duct Construction Standards – Metal and Flexible.

K. Conform to AMCA bulletins regarding construction and testing. Fans shall bear AMCA certified rating seal.

L. Units shall be products of manufacturer regularly engaged in production of such units and issuing complete catalog data on such products.

M. Manufacturer shall assure that all equipment provided does not exceed maximum allowable vibration peak-to-peak displacement data listed in the latest ASHRAE HVAC Applications Handbook.

1.03 SUBMITTALS

A. Provide submittals in accordance with provisions of Division 1.

B. Submit the following information:

1. Manufacturer.
2. Model.
3. Fan Type.
4. Wheel Type.

5. Fan Construction Class.
6. Fan Size and Arrangement.
7. Dimensional data including bolt hole locations, total operating weight and corner operating weight data for sizing vibration isolators.
8. Air Flow Capacity, Fan Curves and efficiency data.
9. Static Pressure.
10. Fan Motor Drive.
11. Motor HP and Fan BHP.
12. Sound Power: Discharge and inlet for each octave band.

C. Submit with shop drawings, operating point plotted on RPM curves and vibration peak-to-peak displacement data.

D. Submit manufacturer's printed installation instructions.

E. Submit operating and maintenance manuals.

F. Submit installation and start-up certification.

1.04 JOB CONDITIONS

A. Do not operate fans for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings have been lubricated, dampers control is in operation, and fan has been under observation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Greenheck or approved equal

B. In case of substitution, equivalent fan selections shall not increase motor horsepower, increase noise level, increase tip speed by more than 10 percent, or increase inlet air velocity by more than 20 percent, from that scheduled.

C. Fan performance shall be based on project altitude rating conditions.

D. Refer to Drawings for performance requirements.

2.02 MOTORS AND CONTROLS

A. Motors: Provided with equipment. Refer to Section 15058 Common Motor Requirements for HVAC Equipment

B. Motor Starters: Provided under Division 15. Refer to Section 15058 Common Motor Requirements for HVAC Equipment

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

D. Fan Motors shall be heavy duty, premium efficiency TEFC or ODP for indoor units with a 1.15 service factor operable at 460 volts, 60 Hz, 3-phase or as specified in mechanical equipment schedule.

E. Provide with factory-mounted NEMA 4X SS disconnect switch/starter with each fan

F. Drive bels and sheaves shall be sized for 200% of the motor horsepower,

G. Fan shaft bearings shall be Air Handling quality and be sized for an L-10 life of no less than 100,000 hours.

2.03 GENERAL SELECTION, RATING AND BALANCING

A. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.

B. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.

C. Fabrication: Conform to AMCA 99.

D. Static and Dynamic Balance: Eliminate vibration or noise transmission to occupied areas.

E. Static Pressure Variations: Provide fans capable of accommodating static pressure variations of + 10 percent.

F. Fan Motor Brake Horsepower: Shall include air performance drive losses, and all other losses of related manufacturer furnished components as applicable. Fans shall be capable of overcoming losses of backdraft dampers, where specified.

G. V-Belt Drives: Provide balanced variable sheaves for motors 7.5 HP and under, and fixed sheaves for 10 HP and over. Sheaves shall be cast iron or steel. Belts shall match sheaves and the drive rated for minimum 1.5 times nameplate rating of motor.

H. Balancing: Statically and dynamically balance fans to eliminate vibration or noise transmission to occupied areas of the building.

I. Belt and Shaft Guards: Galvanized steel sides and expanded metal face with opening for tachometer for belts and sheaves, galvanized steel for exposed drive shafts.

J. Safety Screen: Provide where inlet or outlet is exposed.

K. Weather Hood: Provide for fan motors and drives exposed to the weather.

L. Bearings: Self-aligning pillow block regreaseable ball type L10, 200,000 hour average lift per AFBMA and ANSI B3.15. Extend lubrication fittings to accessible locations exterior of fan casings.

M. Motor Mount: Adjustable slide type.

2.04 PAINTING

A. Factory Prime Coat: Required on all surfaces of ferrous fan housings and wheels. Painting outside is not required on aluminum fans.

B. Ferrous Fans Exposed to Weather: Prime coat and finish with corrosion resistant epoxy paint, electrostatically applied. Coating system shall exceed 4000+ hours ASTM B117 Salt Spray Resistance

2.05 WHEEL AND INLET

A. Backward Inclined: Steel or aluminum construction with smooth curved inlet flange, heavy back plate, backwardly curved blades welded or riveted to flange and back plate; cast iron or cast steel hub riveted to back plate and keyed to shaft with set screws. Spark proof type.

B. Airfoil Wheel: Steel construction with smooth curved inlet flange, heavy back plate die formed hollow airfoil shaped blades continuously welded at tip flange, and back plate; cast iron or cast steel hub riveted to back plate and keyed to shaft with set screws. Spark proof type.

2.06 CENTRIFUGAL FANS - GENERAL

A. General: Fans shall have capacities not less than scheduled and shall be constructed and rated in accordance with the AMCA Standards. The fans shall be belt drive, with adjustable sheaves for motors 7.5 HP or less and fixed sheaves for larger motors. Provide multiple belt drives and shall be designed for 50% overload capacity and the moto9rs for such drives shall be equipped with adjustable bases or slide rails. Wheels and sheaves shall be heavily and rigidly constructed and balanced both statically and dynamically, and be free from objectionable vibration or noises. Bearings shall be self-aligning, ball bearing type and shall be complete with grease fittings, extended for easy access where necessary. The actual brake horsepower of the fan and the drive shall not exceed the nameplate rating of the motor driving the fan. Fans shall deliver the design capacity of actual static pressures and drive sheaves shall be changed if necessary to deliver the design capacity at actual static pressures, and to deliver design air volume. Furnish with a metal identification plate indicating areas served, CFM, HP, RPM, SP and size of unit.

B. Fans assembly shall be class II minimum and shall be equipped with spun intake cone. Refer to drawing for blade type and discharge arrangements.

C. The outer casing shall be coated with minimum of two coats corrosion resistant enamel paint with a minimum of 12 gauge arc welded construction. The fans shall be supplied with fixed straightening vanes for conversion of

velocity pressure into useful static pressure and thus increasing efficiency and reducing turbulence. Provide adjustable motor mount base having a four-point leveling and to insure proper drive tension and alignment. The fan ratings shall be based on tests made in accordance with AMCA Standard 210 and shall bear the AMCA seal.

D. MI fan wheels shall be coated with minimum of two coats corrosion resistance and have tapered spun wheel cones or shrouds providing stable flow and high rigidity. Wheels shall be non-overloading type and spark proof type.

E. Unit shall be statically and dynamically balanced and complete fan assembly shall be test balanced at the operating speed prior to shipment.

F. Shafts shall be hot rolled steel accurately turned, ground, polished, and ring gauged for accuracy. Shafts to be sized for first critical speed of at least 1.43 times the maximum speed for the class.

G. Bearings shall be heavy duty, grease lubricated, anti-friction ball or roller, self-aligning, pillow block type and selected for minimum average bearing life in excess of 200,000 hours at the maximum class RPM.

H. Unit shall be complete with inlet and outlet flange connections, inlet screen, access panel, totally enclosed belt guard.

I. Unit shall be equipped with drain hole and drain valve connection at the bottom of fan casing.

J. Vibration Isolation: Refer to Section 15240 Mechanical Sound, Vibration

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer’s instructions.

B. Install fans with resilient mountings and flexible electrical leads. Fan manufacturers shall provide detail mounting and corner weight information for coordination with vibration isolator manufacturer for proper final selection of vibration isolators.

C. Install flexible connections specified in Section 15910 - Duct Accessories between fan inlet and discharge ductwork. Ensure metal bands of connectors are parallel with minimum 1-inch (25 mm) flex between ductwork and fan while running. Flexible connections located outdoors shall be provided with sun shield.

3.02 START-UP

A. Inspect equipment after installation to verify installation is in accordance with specifications, equipment is lubricated, proper belt tension, and that equipment is otherwise ready to operate.

B. Perform air side test and balance as applicable. Refer to Section 15990 - Testing, Adjusting, And Balancing.

C. Provide the services of manufacturer's representative for starting up units and instruction of Owner's operating personnel.

END OF SECTION

SECTION 15890 - DUCTWORK

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes sheet metal materials, fasteners, supports, and duct construction classifications for:

1. Supply, return, and exhaust systems.
2. Fume hood exhaust system.
3. Kitchen grease hood exhaust system.
4. Air Devices

1.02 DEFINITIONS

A. Definitions: In accordance with SMACNA and ASHRAE.

1.03 QUALITY ASSURANCE

A. Comply with the following reference standards. Use most recent edition of all references.

1. ASHRAE - American Society of Heating, Refrigeration and Air Conditioning Engineers Handbooks.
2. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association, Inc.
    a. Duct Construction Standards.
    b. Fire Damper and Heat Stop Guide.
    c. HVAC Systems Testing Adjusting and Balancing.
    d. Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems.
3. NEBB - National Environmental Balancing Bureau Manual: Procedural Standards for Testing - Balancing - Adjusting of Environmental Systems.
4. AABC - Associated Air Balance Council Manual: National Standards for Total System Balance.
5. ANSI - American National Standard Institute.
6. NFPA - National Fire Protection Association Standards: referred to as NFPA 90A, NFPA 90B, NFPA 96, etc.
7. UL - Underwriters' Laboratories Standards for Safety: referred to as UL 181, UL555, etc.

8. ACGIH - American Conference of Governmental Industrial Hygienists: Industrial Ventilation - A Manual of Recommended Practice.

9. City and County of Honolulu Building Code.

10. City and County of Honolulu Fire Code.

B. Above referenced standards may be superseded by notes and details on Drawings and in specification.

C. Where two or more references conflict, the most stringent, as determined by Architect, shall take precedence.

1.04 SUBMITTALS

A. Provide submittals in accordance with Division 01.

B. Submit typical shop standards and/or SMACNA details for each class of duct specified, including particulars such as gauge sizes, welds, joint details, and fitting configurations prior to start of work.

C. Submit written report confirming ductwork has been fabricated and installed in accordance with SMACNA Standards.

D. Submit shop drawings of ductwork including elevations and showing all terminal units and air devices connections. Drawings shall be at a minimum scale of 1/4 inch = 1’-0”. Refer to 15010 Mechanical General Requirements for coordination shop drawings requirements.

E. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.

F. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

1.05 FLOW DIAGRAMS

A. Construction Documents may include flow diagrams as part of the working Drawings.

1. These flow diagrams are not for the purpose of giving physical dimensions or locations but rather to make clear the interconnections, of the duct systems.

2. If an item is shown on either the flow diagram or the floor plans, but not on both. The Contractor must include such item in the cost of the work and provide this time.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufactured Round and Oval Ductwork:

1. Buckley.
2. Spiral Metal Corporation.
3. United Sheet Metal.
4. Or equal

B. Duct Connection Systems:

1. Ductmate Industries, Inc.
2. Or equal

C. Flexible Connections:

1. Ventfabrics.
2. DuroDyne.
3. Or equal

D. Duct Protective Coatings:

1. Wisconsin Protective Coating, Inc.
2. Varni-lite Corp. of America.
3. Or equal

E. Duct Sealants:

1. Minnesota Mining and Manufacturing Co.
2. Benjamin Fostor Co.
3. Miracle Adhesive Co.
4. United Sheet Metal Division United McGill Corp.
5. Hardcast Corp., Inc.
6. Or equal

F. Air Devices

1. Titus
2. Price

3. Or equal

2.02 DUCT CONSTRUCTION CLASSIFICATIONS

A. General: Construct and seal ductwork in accordance with SMACNA pressure classifications and seal classes listed for ductwork systems involved.

B. Rectangular Ductwork:

1. +1 inch WG Class With Seal Class C: Supply air ductwork downstream of terminal boxes.

2. -2 inches WG Class With Seal Class B: Return air ductwork and general exhaust branch ductwork.

3. +2 inches WG Class With Seal Class B: Constant volume supply air ductwork in systems without terminal boxes, supply air ductwork ahead of operating room HEPA filters.

4. +4 inches WG Class With Seal Class A: Supply air ductwork upstream of terminal boxes.

5. -3 inches WG Class with Seal Class A: General exhaust duct risers and main ductwork.

6. -6 inches WG Class With Seal Class A: Hazardous exhaust systems for sterile processing, hoods and safety cabinets.

7. -4 inches WG Class All Welded Construction: Kitchen grease hood exhaust ductwork.

8. -4 inches WI) Class With Seal Class A: Negative Pressure Isolation Rooms exhaust system.

C. Round or Oval Ductwork: Same as rectangular ductwork.

2.03 MATERIALS

A. Sheet Metal:

1. Steel sheets:

a. Cold rolled, soft steel sheets.

b. Meeting ASTM 526-MT.

c. Black or galvanized as specified.

d. Galvanizing: 1-1/4 ounces per square foot total both sides. 1.) Lock-forming quality.

B. Miscellaneous Products:

1. Screws and rivets.

a. Same material as sheet, except as noted.

b. Zinc or cadmium plated permitted on galvanized sheets.

c. Minimum screw size: No. 10.

d. Minimum rivet size: 4 pound.

2. Duct Sealants:

a. Sealing compound: Similar to 3M Brand No. 700, Hardcast 321, or equal.

b. Tape: Similar to 3M NO. 474.

c. Gaskets:

1) Continuous, reinforced, inert, self-conforming type.

2) 1/8 inch thick.

3) Width: To match angle connection.

4) Similar to 3M Weatherban Sealant Tape 1202.

3. Hard-setting joint tape:

a. Two-part tape:

1) Mineral impregnated woven fiber tape.

2) Impregnated with activator/adhesive of polyvinyl acetate type.

b. UL Listed

1) Flame spread: 10.

2) Smoke contributed: 0.

c. Similar to Hardcast

4. Spring Fasteners:

a. Oval head stud and receptacle.

b. Screwdriver slot.

c. Self-ejecting.

d. Similar to Ozus.

5. Angles, tie rod and shapes for reinforcing ducts: In accordance with SMACNA HVAC Duct Construction Standards, except as noted.

6. Duct connection system:

    a. Transverse bolted duct joints.

    b. Factory fabricated components.

    c. Flanges with sealant.

        1) Permanent, non-hardening.

    d. Corner pieces.

    e. Assemble with gasket tape.

    f. Similar to Ductmate Industries “Ductmate 35.”

C. Turning Vanes

1. Galvanized steel ductwork: Galvanized steel or painted black steel, except as noted.

2. Other ductwork: Same material as ductwork.

3. Construction per SMACNA HVAC Duct Construction Standards for:

    a. Single wall vanes.

        1) With 3/4 inch trailing edge.

        2) Use only in ducts with maximum air velocity below 2000 fpm.

    b. Double wall vanes: Use in ducts with maximum air velocity of 2000 fpm or higher.

    c. Vane length: Provide separate equal size sections for vane length greater than those indicated in referenced “Standards.”

    d. Vane runners:

        1) Type 1 or 2 acceptable.

        2) Submit any other type for approval.

4. Vane radius:

    a. 4-1/2 inch radius: All Duct widths.

2.04 SHEET METAL PLENUMS

A. Construct plenums and equipment casings in accordance with Section 6 of SMACNA standards.

2.05 DIFFUERS, REGISTERS AND GRILLES

A. Diffusers, Registers and Grilles shall be factory-fabricated of aluminum (ss for OAG) and shall distribute the specified quantity of air evenly over space intended without causing noticeable drafts, air movement faster than 50 fpm in occupied zone, or dead spots anywhere in the conditioned area. Sound levels shall be selected in the “below NC 20” range for the flow specified. Outlets for diffusion, spread, throw shall be as required for specified performance. Diffusers and registers shall be provided with opposed blade volume damper with accessible operator, sponge rubber gasketing under all flanges and be white and paintable to match adjacent surfaces. Volume dampers shall be opposed blade type for all diffusers and registers.

   a. Supply air diffuser- SAD: Provide Titus Model TDCA series, supply air diffuser or approved equal. Diffuser shall be square neck, louvered face, 4 way, surface mounted with adjustable pattern in sizes and patterns as indicated.

   b. Supply air register SAR: Provide Titus Model 272RL series with opposed blade damper or approved equal. Register shall have airfoil blades, surface mounted, 3/4 inch blade spacing, adjustable deflection angle, double deflection with front blades parallel to long dimension and in sizes and capacities as indicated.

   c. Return air register RAR and Exhaust air register EAR: Provide Titus Model 272RL series with opposed blade damper or approved equal. Register shall have airfoil blades, surface mounted, 3/4 inch blade spacing, adjustable deflection angle, double deflection with front blades parallel to long dimension and in sizes and capacities as indicated. Provide 90 degree angle “boot” with the same dimensions as the register neck size to block light and sound from the ceiling from entering the auditorium. Construct boot with 25 micron fiber mesh reinforced aluminum foil facing on both sides of the panel.

   d. Outside Air Grille OAG: Provide Titus Model 350RL SS series or approved equal. Grille shall be louvered, stainless steel for exterior locations, surface mounted, 3/4 inch louver spacing, 45 degree fixed deflection angle with blades parallel to long dimension and in sizes and capacities as indicated.

PART 3 - EXECUTION

3.01 DUCTWORK INSTALLATION

A. General

   1. Construct with gauges, joints, bracing, reinforcing, and other details per latest SMACNA unless specified otherwise.

      a. Provide ducts with NFPA 90A gauges when traversing smoke zones.

   2. Construct of galvanized sheet metal except where otherwise indicated.

3. Provide for duct rigidity by either of these methods:

    a. Cross beading at 12 inches on center, maximum.

    b. Provide additional reinforcement if “drumming” or “oil-canning” occurs during fan operation.

    c. Diagonally crossbreak all panels on metal rectangular ducts over 18 inches in either direction.

        1) Crossbreak outward in ducts having positive internal pressure.

        2) Crossbreak inward in ducts having negative internal pressure.

4. Alter duct sizes on basis of equal friction where required to facilitate installation.

5. At exposed duct penetrations of wall, floors, and ceilings, provide sheet metal angle type escutcheons.

6. Run duct straight and parallel with adjacent wall.

7. Duct shall penetrate perpendicular to wall.

8. Tapers:

a. Pitch sides of duct in 45° “diverging” or 60° “converging” airflow to SMACNA standards.

9. Duct openings:

    a. Provide openings where required to accommodate thermometers, smoke detectors, controllers, etc.

        1) Caulk or gasket as needed to be airtight.

    b. Provide pitot tube openings where required for testing of systems:

        1) Complete with metal cap with spring device or screw to ensure against air leakage.

    c. Where openings are provided in insulated ductwork for insertion of instruments, properly retape insulation when done.

    d. At fire dampers, allow adequate length of length of duct to install access door.

10. Volume dampers.

    a. Install damper where specified in Section 15910 - Ductwork Accessories.

    b. Install damper as needed for proper system balancing.

11. Ducting: Use galvanized steel sheet for all applications listed except use stainless steel in constructing ductwork for sterilizer and steam wash hood exhaust system.

B. Elbows and Splits:

1. Use radius elbows in rectangular ducts or square elbows with turning vanes.

    a. Centerline radius not less than 1-112 duct width.

2. Where space does not permit duct radius specified above, install short radius splitter vanes per referenced “Standards.”

    a. Number of vanes determined by ratio of inner radius (R) to duct width in plane of radius (W).

        1) 1 vane: R/W above 0.3.

        2) 2 vanes: R/W between 0.1 and 0.3.

        3) 3 vanes: R/W 0.1 and smaller.

3. Do not use square turns in rectangular ductwork, unless indicated otherwise and only at following locations:

    a. Immediately upstream from supply air outlets.

    b. Where required to facilitate installation.

    c. Do not install one square turn immediately after another.

4. Install turning vanes as specified above in all square turns, unless otherwise indicated.

5. Do not use turning vanes in square turns in rectangular ducts in the following applications:

    a. Kitchen hood exhausts.

    b. Fume hood exhaust.

6. ±2 inches wg. Class or higher ductwork, secure vane to duct in accordance with SMACNA standards.

7. Two-way splits:

    a. Supply, return and exhaust.

    b. Two elbows.

    c. Proportionally sized per SMACNA Duct Standards.

        1) Radius or square.

d. Single fitting acceptable.

1) With turning vanes.

2) Duct openings sized as above.

C. Rectangular Duct Joints:

1. Standing seams, except where flush drive slip seam called for.

2. Use flush, drive-slip, for:

a. Exposed ducts:

1) Except in garages, mechanical rooms.

b. Where required for clearance.

3. “Ductmate” system joints may be used in lieu of standing seams.

D. Joint Sealing:

1. Seal transverse and longitudinal joints of sheet metal ducts by one of the following methods:

a. 6-ounce canvas strip, 6 inches wide.

1) Adhere with lagging adhesive.

b. Hardcast 321 sealer.

c. United Hi-Velocity sealer.

d. Applications as recommended by manufacturer.

2. Seal punched holes and corner cracks.

3. After installation and testing, reseal joints found to be leaking.

E. Outdoor Ducts:

1. Make ducts subject to rain watertight.

2. Construct as follows to assure water runoff:

a. Arrange standing seams to not act as dams.

b. Place longitudinal seams at bottom of duct.

c. Slope entire top of duct down toward side.

d. Provide vertical struts within duct to bow top panels of duct into convex shape.

e. Use mastic within sheet metal joints.

3.02 DUCT HANGERS AND SUPPORTS

A. General:

1. Support horizontal ducts with hangers of size and spacing as indicated in pertinent SMACNA Duct Construction Standards.

2. Attachment to structure: As specified in Section 15062 Hangers and Supports for HVAC Piping and Equipment.

3. Vibration isolation for ducts: As specified in Section 15240 Mechanical Sound, Vibration.

4. Seismic restraints: As specified in Section 15062 Hangers and Supports for HVAC Piping and Equipment

B. Horizontal Duct Supports - Non Seismic:

1. Install hangers at each change in direction of duct.

2. Strap hangers:

   a. Extend strap down both sides of ducts.

   b. Turn under bottom 1 inch minimum.

   c. Metal screw hangers to:

      1) Bottom of duct.

      2) Upper and lower sides of ducts.

      3) Not more than 12 inches on center.

      3. Angle hangers:

   d. Provide angle hangers formed by extended vertical bracing angles.

   e. Or by rods connecting to bottom angles if size or bracing angles conform to hanger schedule.

4. Support rectangular fume and grease exhaust ducts on angle hangers welded to the side and bottom of ductwork.

   a. Do not penetrate duct with fasteners.

5. Support circular fume and grease exhaust ducts with flat bar bands around duct.

   a. 1/4 inch by 2 inch steel.

   b. Hot dipped galvanized after fabrication.

   c. Fasten top to hanger rod.

d. Bolt bottom of bands.

C. Vertical duct supports Non-Seismic:

1. Support vertical ducts at every floor.

2. Use angles or channels riveted to ducts.

3. Set angles or channels on floor slab or structural steel members placed in opening, unless otherwise noted.

3.03 PLENUM INSTALLATION

A. General:

1. Construct plenums with gauges, joints, bracing, reinforcing, and other construction details in accordance with latest SMACNA unless specified otherwise.

2. Construct galvanized sheet metal of lock forming quality.

3. Install hinged access doors where shown, specified, or required for access to equipment for cleaning and inspection.

a. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles.

4. Paint inside of plenums on discharge of air washers and spray coils with 2 coats of Bitumastic.

5. Make provisions for floor drains if required for floor-mounted plenums.

6. Install sleeves and airtight sealing for all piping penetrating plenum walls.

a. Sealing method shall allow movement of water and steam pipes.

B. Sheet Metal Plenum Construction:

1. Galvanized sheet metal.

a. Galvanized angle bracing as required.

b. Riveted or bolted to sheet metal.

c. 16 gauge, unless otherwise indicated.

d. Panels cross-broken.

2. Seams:

a. 2 inch standing seams, 24 inches on center.

b. Staggered at adjacent panels.

3. Reinforcing:

a. 2 by 2 by 1/4 inch galvanized angles.

b. Riveted or bolted to back of sheet metal.

c. Perpendicular to standing seams.

d. Angles at:

1) Floor, wall and ceilings.

2) Corners.

3) Around openings.

4) On center.

4. Fasten to floors, ceilings and/or walls:

a. Sealed with mastic.

b. Seams and joints sealed and made airtight.

c. To comply with seismic requirements.

3.04 MISCELLANEOUS INSTALLATIONS

A. Install following equipment and materials furnished under other sections.

1. Balancing dampers.

2. Fire dampers.

3. Control and smoke dampers.

4. Filters.

5. Sound traps.

6. Access doors.

7. Duct mounted smoke detectors.

3.05 DUCT PRESSURE TESTING

A. Scope of Pressure Testing:

1. Test ductwork as scheduled below for leaks.

a. Pressure test randomly selected sections of representative supply, return and exhaust systems.

2. Apply positive pressure test to all ducts intended to operate under positive pressure, such as:

a. Supply ducts from fans to air outlets.

b. Supply ducts from fans to air terminal units.

c. Supply ducts from air terminal unites to air outlets.

3. Apply (negative) pressure test to all ducts intended to operate under negative pressure, such as:

a. Return ducts from air inlets to fans. (Not required on portions of duct exposed in spaces served by duct.)

b. Toilet exhaust ducts from air inlets to fans.

c. General exhaust ducts from air inlets to fans.

d. Kitchen exhaust ducts from hoods to fans.

e. Dishwasher exhaust ducts from hoods to fans.

f. Fume hood exhausts from cabinets or hoods to fans.

4. (Not required when exposed in space served by outlets.)

a. Discharge ducts from exhaust fans to outside.

b. Flexible duct connections to air outlets.

B. General:

1. Use portable high pressure blower and necessary instruments.

a. Provide duct connections required for air flow and pressure testing.

2. Conduct tests as follows and as recommended in SMACNA balancing manual.

a. See Section 15990 - Testing, Adjusting, and Balancing.

3. Test before sections are concealed.

4. Furnish signed reports of results of tests to Architect.

5. Test Pressures: Larger of following:

a. 2 inches w.g. above scheduled static pressure for fan or unit.

b. 125 percent of scheduled static pressure for fan or unit.

c. 10 percent above highest point on fan curve.

C. Procedure:

1. Seal openings in ducts and plenums to be tested.

2. Connect test apparatus to test section using flexible duct connections or hose.

3. Close damper on blower suction side, to prevent excessive buildup of pressure.

4. Start blower and gradually open damper on suction side of blower.

5. Test for audible air leaks in ducts and plenums per referenced standards.

   a. Repair all audible leaks.

   b. Do not retest until sealants have set.

6. Test for rate of air leakage in ducts and plenums per referenced standards.

   a. Determine amount of air leakage by makeup airflow measurements.

7. Repair air leaks as required and retest.

8. Visually mark tested sections with certification sticker and initials of field test inspector.

D. Total Leakage Allowable:

1. Per seal and leak class specified above and as defined by SMACNA Manuals but not to exceed 4% of sum of outlets and inlets air quantities connected to the particular fan system being tested.

3.06 DUCT MATERIAL SUMMARY

A. Table 1:

SYSTEM	MATERIAL
Supply (general)/Return/Outside	Galvanized Steel
Exhaust (general)	Galvanized Steel

3.07 AIR DEVICE INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Owner's Representative for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

D. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 15900 - HVAC INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

A. The General Requirements of the Specifications, apply to the work specified in this section.

1.02 SUMMARY

A. This section covers the furnishing, fabrication, delivery and installation of an addition to the existing direct digital control (DDC) system for all new mechanical and plumbing equipment requirements DDC monitoring and controls for KVMH Imaging Department Renovations.

B. The additional programming to the DDC system shall seamlessly integrate the new mechanical equipment serving KVMH Imaging Department Renovations including an air handling unit, CRAC unit, terminal units, and other misc. field devices as required by the DDC points list into the existing DDC system. Provide all necessary hardware and software for integration. The contractor shall review the sequence of operation indicated and program the sequence of operations into the DDC system. All new graphics will be added to the existing workstation and uploaded to the existing server

C. Provide necessary labor and material to support commissioning of the new mechanical system.

1.03 REFERENCES (latest versions)

A. ASME B31.1 Power Piping.

B. NFPA 70 National Electric Code.

C. ASHRAE 135-2016 Data Communication Protocol for Building Automation and Control Networks.

D. UL 916 UL Standard for Safety; Energy Management Equipment

E. ANSI C12.10 Standard for Electromechanical Watthour Meters.

F. ANSI C57.13.2 Standard Conformance Test Procedures for Instrument Transformers

G. ASME B16.5 Pipe Flanges and Flanged Fittings NPS ½ Through NPS 24.

H. ASTM A 126

I. UL 506 UL Standard for Safety Specialty Transformers.

J. UL 1449- UL Standard for Safety Transient Voltage Surge Suppressors

K. ANSI B40.1 Gauges - Pressure Indicating Dial Type - Elastic Element

1.04 DEFINITIONS

A. BACnet: BACnet is a standard communication protocol under development by the American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE). The controller manufacturer shall have a company policy to support the implementation of BACnet.

B. Digital Controller: A control module which is microprocessor based, programmable by the user, has integral I/O, and performs stand-alone operations.

C. Direct Digital Control (DDC): A digital controller as defined in this document. The controller directly senses the building environment and makes control decisions based on user defined, controller resident programs. The controller outputs control signals that directly operate valves, dampers, and motor controllers. No conventional control devices, pneumatic or electronic, such as receiver-controllers, thermostats, and logic units are present within or interface with a direct digital control loop. Actuators are electric or pneumatic, and the controller output is converted to the appropriate type of signal.

D. DDC System: A system made up of one or more digital controllers. Required climate control and energy management functions for complete operation of an HVAC system are provided by DDC from digital controllers. No conventional control devices (pneumatic or electronic) such as receiver-controllers, thermostats, and logic units are used. Digital controllers in a system are linked in a communication network composed of one or more levels of local area networks (LAN).

E. Distributed Control: The intent of distributed control is to install the controllers near the equipment being controlled, and to distribute the processing to each stand alone DDC panel. The control system is built up of stand-alone controllers, utilizing sensor inputs and control outputs.

F. Dynamic Control: A process that optimizes operation of HVAC systems (air handler units, converters, chillers, and boilers) by increasing and decreasing setpoints or starting and stopping equipment in response to heating and cooling needs of downstream equipment. A requirement of dynamic control is knowing the heating/cooling demand status of downstream equipment, therefore dynamic control requires controllers connected in a communications network.

G. Firmware: Firmware is software programmed into read only memory (ROM) and erasable programmable read only memory (EPROM) chips. Software may not be changed without physically altering the chip.

H. Graphic Sequence of Operation: A drawing or graphic showing all interlocks and control loop sequences between the input and output points. Graphic sequence of operation is a graphical representation of the sequence of operation. The graphic sequence of operation will show all inputs, outputs, and logic blocks.

I. Hand-Held Terminal: A hand-held terminal is a portable device, control system manufacturer-specific, which can be connected directly to a communications port on a digital controller and through which the digital controller can be interrogated and, in some cases, programmed.

J. Input/Output (I/O): I/O refers to analog inputs (AI), digital inputs (DI), analog outputs (AO), and digital outputs (DO) in a digital controller. Inputs are from analog sensors (temperature, pressure, humidity, flow) and digital sensors (motor status, flow switches, switch position, and pulse output devices). Outputs operate modulating and on/off control devices.

K. I/O Unit: An I/O unit provides additional point capacity to a digital controller and communicate with the stand-alone digital controller on LAN. An I/O unit is not stand-alone because the control program does not reside in the I/O units microprocessor.

L. Integration: The ability of control system components to have interoperability between different manufacturers to connect together and provide coordinated control via real-time data exchange and control functions through a common communications data exchange protocol. Integration shall extend to the operator's workstation software, which shall support user interaction with all control system components. Methods of integration include industry standard protocols such as: BACnet, ARCnet, LonMark/LonTalk, OLE for Process Control (OPC) or integrator interfaces between cooperating manufacturer's systems.

M. Local Area Network (LAN):

1. A communications bus that interconnects digital controllers for peer-to-peer communications. Different levels of LANs are possible within a single DDC system. In this case a digital controller on a higher level LAN acts as a network controller to the controllers on the lower level LAN. The network controller, then, has at least two LAN communications ports. One port supports peer-to-peer communications with other digital controllers on the higher level LAN. The other port supports communications with the digital controllers on the lower level LAN.

2. LANs permit sharing global information, make it possible to apply building wide control strategies such as peak demand limiting, permit dynamic control strategies, allow coordinated response to alarm conditions, and permit remote monitoring and programming of digital controllers.

3. Facility-wide LAN refers to a commercially available local area network. These LANs allow the connection to an existing or new facility-wide LAN.

N. Microprocessor: A microprocessor refers to the central processing unit (CPU) that contains all the registers and logic circuitry that make it possible for digital controllers to do computing.

O. Open Protocol Bus (OPB): A pre-programmed communications integrator that allows devices from one manufacturer to communicate and interact with those of another.

P. Open System Port (OSP): A user programmable communications port that provides the ability to develop custom communications processes to integrate other operating systems with the DDC System.

Q. Output Signal Conversion: Output signal conversion refers to the changing of one kind of control output into a proportionally related signal appropriate for direct actuation of the controlled device. Signals are converted by a transducer which may be external to the digital controller originating the output.

1. Examples in modulating control of pneumatic actuators are conversion of 4-20 ma signals into proportional 3-15 psig signals.

2. An example of output signal conversion in on/off or open/close control is a contact closure originating in a digital controller which activates a solenoid air valve which passes main air, thereby forcing a damper to open fully.

R. Optimum Start: Optimum start is a method of starting the HVAC equipment prior to occupancy time in order to have the building at setpoint at occupancy. Optimum start shall be based on the zone temperatures, zone setpoints, and outdoor temperature. Optimum start will bring the zone to setpoint at occupancy time.

S. Peer-to-Peer: Peer-to-Peer refers to controllers connected on a communications LAN that act independently, as equals and communicate with each other to pass information which facilitates control.

T. PID: PID refers to proportional, integral, and derivative control; the three types of action that are used in controlling modulating equipment.

U. Resolution: Refers to the number of possible states an input value or output value can take and is a function of the digital controller I/O circuitry; the A/D converter for input and the D/A converter for output. Ten bit resolution has 1024 possible states and eight bit resolution has 256 possible states.

V. Terminal Control Unit (TCU): An off-the-shelf, stand-alone digital controller equipped for communication on a lower level local area network. TCUs may deviate from stand-alone only in receiving energy management and time information from a stand alone digital controller. A TCU is commonly application specific and is used for distributed control of specific HVAC subsystems. A TCU communicates with the digital controllers. Typically, a TCU communicates on a lower level LAN. Examples where TCUs might be used to control of small air handling units (AHUs), variable air volume (VAV) boxes, fan coil units, and heat pumps.

1.05 SYSTEM PERFORMANCE

A. Comply with the following performance requirements:

1. Graphic Display: Display graphic with minimum 20 dynamic points with current data within 10 seconds.

2. Graphic Refresh: Update graphic with minimum 20 dynamic points with current data within 8 seconds.

3. Object Command: Reaction time of less than two seconds between operator command of a binary object and device reaction.

4. Object Scan: Transmit change of state and change of analog values to control units or workstation within six seconds.

5. Alarm Response Time: Annunciate alarm at workstation within 45 seconds. Multiple workstations must receive alarms within five seconds of each other.

6. Program Execution Frequency: Run capability of applications as often as five seconds, but selected consistent with mechanical process under control.

7. Performance: Programmable controllers shall execute DDC PID control loops, and scan and update process values and outputs at least once per second.

8. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:

   a. Water Temperature: Plus or minus 1 deg F (0.5 deg C).

   b. Water Flow: Plus or minus 5 percent of full scale.

   c. Water Pressure: Plus or minus 2 percent of full scale.

   d. Electrical: Plus or minus 5 percent of reading.

1.06 SEQUENCE OF OPERATION

A. See descriptions in the drawings and specifications to determine how the HVAC system is to be operated, monitored and controlled by the DDC system.

1.07 SUBMITTALS

A. Submit in accordance with Division 1.

B. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.

   1. DDC System Hardware: Bill of materials of equipment indicating quantity, manufacturer, and model number. Include technical data for operator workstation equipment, interface equipment, control units,

transducers/transmitters, sensors, actuators, valves, relays/switches, control panels, and operator interface equipment.

2. Control System Software: Include technical data for operating system software, operator interface, color graphics, and other third-party applications. Operator interface shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone.

3. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.

C. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Bill of materials of equipment indicating quantity, manufacturer, and model number.

2. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.

3. Wiring Diagrams: Power, signal, and control wiring.

4. Details of control panel faces, including controls, instruments, and labeling.

5. Written description of sequence of operation.

6. Schedule of valves including flow characteristics.

7. DDC System Hardware:

   a. Wiring diagrams for control units with termination numbers.

   b. Schematic diagrams and floor plans for field sensors and control hardware.

   c. Schematic diagrams for control, communication, and power wiring, showing trunk data conductors and wiring between operator workstation and control unit locations. Description of the various types of wire or cables with the designated function shall be provided.

8. Control System Software: List of color graphics indicating monitored systems, data (connected and calculated) point addresses, output schedule, and operator notations.

9. Controlled Systems:

   a. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.

   b. Scaled drawings showing mounting, routing, and wiring of elements including bases and special construction.

c. Written description of sequence of operation including schematic diagram.

d. Points list.

1.08 DATA COMMUNICATION PROTOCOL CERTIFICATES

A. Certify that each new proposed DDC system component complies with ASHRAE 135. BACnet/LonWorks. All new unit level controllers will communicate to existing Trane Tracer BCU's via LonWorks communication protocol to be consisten with the existing site topology.

1.09 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Manual/Documentation: This manual or documentation is intended to provide a complete description of the HVAC system and DDC control system. The following information shall be provided in a 3-ring binder(s) unless mentioned otherwise:

1. Description of HVAC System: Provide a general description of the HVAC system and major equipment that it is comprised of. Provide a list of installed equipment with the manufacturer's name and model/part number. The listed items shall be labeled such that it can be referenced to a particular piece of equipment on the as-built drawing (example: CH-2, CHWP-2, etc.). Information for the HVAC equipment should be furnished by catalog data or other submittals in other Division 15 specification sections.

2. Description of DDC Control System: Provide a general description of the DDC control system with list of parts with name of manufacturer and model/part number unless every item in the DDC as-built drawings already contain this information. Refer to DDC controls as-built drawings.

3. Control equipment catalog cuts providing description of equipment specifications (if applicable), software specifications, power and communication signal information, etc.

4. Maintenance instructions and lists of spare parts for each type of control device and compressed-air station components (if applicable).

5. Printout of pre-programmed operating parameters such as leaving chilled water temperature set point, static pressure setting for each SCHWP, etc.

6. Service Organization: Qualified service organization list that shall include the names and telephone numbers of an organization(s) located in the State of Hawaii qualified to troubleshoot and service the DDC control system.

B. Software and Firmware Operational Documentation: Include the following:

1. DDC Software operating and upgrade manuals.

2. DDC Program Software Backup: On a magnetic media or compact disc, complete with data files.

3. Device address list.

4. Listing of all software applications required for operation of and accessing into the DDC control system.

5. Software license required by and installed for DDC workstations and control systems.

C. As-Built Drawings: A complete set of as-built drawings for the HVAC system is to be a combination of as-built design drawings and as-built control drawings which should show locations of all HVAC equipment and field installed accessories, how the systems are intended to operate and DDC control shop drawings which should show the manufacturer of equipment, network diagrams, communication protocols, all components, list of materials, etc.

1.10 QUALITY ASSURANCE

A. Installer Qualifications: DDC control system manufacturer's authorized representative who is Trane factory trained and approved for installation of system components is required for this project.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with ASHRAE 135 for DDC system components

D. The DDC Contractor shall be Trane and have a minimum of 10 years experience with the complete installation of the DDC control systems. The DDC Contractor shall provide a list of comparably sized and/or technically complex control systems installed for 3 other buildings or facilities which are still in operation at the time for bidding on this project.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to equipment manufacturer.

B. System Software: Update to latest version of software at Project completion.

1.12 COORDINATION

A. Coordinate electrical power supply for all mechanical equipment, motors, field devices and DDC control components with the Electrical Consultant.

1.13 WARRANTY

A. Warranty labor and materials for specified control system free from defects for a period of I year after final acceptance. Control systems failure during warranty period shall be adjusted, repaired or replaced at no additional cost or reduction in service.

B. Work shall have a single warranty date even if the building or facility receives beneficial use due to early system start-up but without final completion, inspection and acceptance.

C. The DDC Contractor shall have a local facility in the State of Hawaii. Emergency service shall be available on a 24 hour/7 day a week basis.

PART 2 - PRODUCTS

2.01 CONTROL SYSTEM

A. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers operating in multi-user, multitasking environment on token-passing network and programmed to control mechanical systems. An operator workstation shall be programmed to be operated and interfaced with the network via dynamic color graphics with each mechanical system, building floor plan, and control device depicted by point-and-click graphics.

B. Connect all new field devices, and equipment unit controller to the existing TRANE SUMMIT BCU-panels and Ensemble server.

2.02 COMMUNICATION

A. This project shall comprise of a network utilizing high-speed [BACnet] for communications between System Controllers. . LonTalk sub-networks shall be used for communications between System Controllers, Custom Application Controllers and Application Specific Controllers.

B. The new system controllers and communication bridges will communicate over the existing IP network infrastructure.

C. All System Controllers and communication bridges shall have an Ethernet communications port for connections with the building LAN system.

2.03 DDC EQUIPMENT

A. Control Units: Modular, comprising processor board with programmable, nonvolatile, random-access memory; integral interface equipment; and backup power source.

1. Units monitor or control each I/O point; process information; execute commands from other control units, devices, and operator stations; and

download from or upload to operator workstation or diagnostic terminal unit.

2. Stand-alone mode control functions operate regardless of network status. Functions include the following:

   a. Global communications.

   b. Discrete/digital, analog, and pulse I/O.

   c. Monitoring, controlling, or addressing data points.

   d. Software applications, scheduling, and alarm processing.

   e. Testing and developing control algorithms without disrupting field hardware and controlled environment.

3. Standard Application Programs:

   a. Electric Control Programs: Demand limiting, duty cycling, automatic time scheduling, start/stop time optimization, night setback/setup, on-off control with differential sequencing, staggered start, antishort cycling, PID control, DDC with fine tuning, and trend logging.

   b. Chiller Control Programs: Control function of condenser-water reset, chilled-water reset, and equipment sequencing.

   c. Programming Application Features: Include trend point; alarm processing and messaging; weekly, monthly, and annual scheduling; energy calculations; run-time totalization; and security access.

   d. Remote communications.

   e. Maintenance management.

   f. Units of Measure: Inch-pound and SI (metric).

B. Local Control Units: Modular, comprising processor board with electronically programmable, nonvolatile, read-only memory; and backup power source.

1. Units monitor or control each I/O point, process information, and download from or upload to operator workstation or diagnostic terminal unit.

2. Stand-alone mode control functions operate regardless of network status. Functions include the following:

   a. Global communications.

   b. Discrete/digital, analog, and pulse I/O.

   c. Monitoring, controlling, or addressing data points.

3. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.

4. ASHRAE 135 Compliance: Control units shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink/physical layer protocol.

C. I/O Interface: Hardwired inputs and outputs may tie into system through controllers. Protect points so that shorting will cause no damage to controllers.

1. Binary Inputs: Allow monitoring of on-off signals without external power.

2. Pulse Accumulation Inputs: Accept up to 10 pulses per second.

3. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4 to 20 mA), or resistance signals.

4. Binary Outputs: Provide on-off or pulsed low-voltage signal, selectable for normally open or normally closed operation with three-position (on-off-auto) override switches and status lights.

5. Analog Outputs: Provide modulating signal, either low voltage (0- to 10-V dc) or current (4 to 20 mA) with status lights, two-position (auto-manual) switch, and manually adjustable potentiometer.

6. Tri-State Outputs: Provide two coordinated binary outputs for control of three-point, floating-type electronic actuators.

7. Universal I/Os: Provide software selectable binary or analog outputs.

D. Power Supplies: Transformers with Class 2 current-limiting type or overcurrent protection; limit connected loads to 80 percent of rated capacity. DC power supply shall match output current and voltage requirements and be full-wave rectifier type with the following:

1. Output ripple of 5.0 mV maximum peak to peak.

2. Combined 1 percent line and load regulation with 100-mic.sec. response time for 50 percent load changes.

3. Built-in overvoltage and overcurrent protection and be able to withstand 150 percent overload for at least 3 seconds without failure.

E. Power Line Filtering: Internal or external transient voltage and surge suppression for workstations or controllers with the following:

1. Minimum dielectric strength of 1000 V.

2. Maximum response time of 10 nanoseconds.

3. Minimum transverse-mode noise attenuation of 65 dB.

4. Minimum common-mode noise attenuation of 150 dB at 40 to 100 Hz.

2.04 UNITARY CONTROLLERS

A. Unitized, capable of stand-alone operation with sufficient memory to support its operating system, database, and programming requirements, and with sufficient I/O capacity for the application.

1. Configuration: diagnostic LEDs for power, communication, and processor; wiring termination to terminal strip or card connected with ribbon cable; memory with bios; and 72 -hour battery backup.

2. Operating System: Manage I/O communication to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms. Perform scheduling with real-time clock. Perform automatic system diagnostics; monitor system and report failures.

3. Enclosure: Dustproof rated for operation at 32 to 120 deg F (0 to 50 deg C).

4. Enclosure: Waterproof rated for operation at 40 to 150 deg F (5 to 65 deg C).

2.05 ELECTRONIC SENSORS

A. Description: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.

B. Thermistor Temperature Sensors and Transmitters:

1. Accuracy: Plus or minus 0.5 deg F (0.3 deg C) at calibration point.

2. Wire: Twisted, shielded-pair cable.

3. Insertion Elements for Liquids: Brass or stainless-steel socket with minimum insertion length of 2-1/2 inches (64 mm) .

C. RTDs and Transmitters:

1. Accuracy: Plus or minus 0.2 percent at calibration point.

2. Wire: Twisted, shielded-pair cable.

3. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches (64 mm).

D. Pressure Transmitters/Transducers:

1. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.

a. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.

b. Output: 4 to 20 mA.

2. Water Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig (1034-kPa) operating pressure; linear output 4 to 20 mA.

3. Water Differential-Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig (1034-kPa) operating pressure and tested to 300-psig (2070-kPa) ; linear output 4 to 20 mA.

4. Differential-Pressure Switch (Air or Water): Snap acting, with pilot-duty rating and with suitable scale range and differential.

5. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; linear output 4 to 20 mA.

E. HVAC Water Flow Meters:

1. Insertion Turbine Flowmeter: Dual axial turbine flowmeter with all installation hardware necessary to enable insertion and removal of the meter without system shutdown. All parts must meet or exceed the pressure classification of the pipe system it is installed in. Insertion Turbine Flowmeter accuracy must be plus or minus 0.5 percent of rate at calibrated velocity, within plus or minus of rate over a 10:1 turndown and within plus or minus 2 percent of rate over a 50:1 turndown. Repeatability must be plus or minus 0.25 percent of reading. The meter flow sensing element must operate over a range suitable for the installed location with a pressure loss limited to 1 percent of operating pressure at maximum flow rate. The flowmeter ,must include 4-20mA output. The turbine rotor assembly must be constructed of Series 300 stainless steel and use Teflon seals.

2. Ultrasonic Flow Meter: Ultrasonic Flow Meters complete with matched transducers, self aligning installation hardware and transducer cables. Ultrasonic transducers must be optimized for the specifice pipe and process conditions for the application. The flow meter accuracy must plus or minus 1 percent of rate from 0.3 to 12 meters/sec 0 to 40 ft/sec. The flowmeter must include 4-20mA output.

2.06 STATUS SENSORS

A. Status Inputs for Pumps: Differential-pressure switch with pilot-duty rating and with adjustable pressure-differential range of 8 to 60 psig (55 to 414 kPa), piped across pump.

B. Status Inputs for Electric Motors: Comply with ISA 50.00.01, current-sensing fixed- or split-core transformers with self-powered transmitter, adjustable and suitable for 175 percent of rated motor current.

C. Voltage Transmitter (100- to 600-V ac): Comply with ISA 50.00.01, single-loop, self-powered transmitter, adjustable, with suitable range and 1 percent full-scale accuracy.

D. Power Monitor: 3-phase type with disconnect/shorting switch assembly, listed voltage and current transformers, with pulse kilowatt hour output and 4- to 20-

mA kW output, with maximum 2 percent error at 1.0 power factor and 2.5 percent error at 0.5 power factor.

E. Current Switches: Self-powered, solid-state with adjustable trip current, selected to match current and system output requirements.

F. Electronic Valve/Damper Position Indicator: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

G. Water-Flow Switches: Bellows-actuated mercury or snap-acting type with pilot-duty rating, stainless-steel or bronze paddle, with appropriate range and differential adjustment, in NEMA 250, Type 1 enclosure.

2.07 THERMOSTATS

A. Combination Programmable Thermostat with combination zone temperature/humidity sensor and Fan controller.

1. Fan Controller with multiple fan speeds "FAN AUTO-HIGH-LOW-OFF".

2. Ability to communicate with exisitng building automation system via 4 to 20 mA or 0- to 10-V dc.

2.08 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.

1. Provide reversible shaded pole, split capacitor, synchronous, or stepped type electric motor.

2. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.

3. Nonspring-Return Motors for Valves Larger Than NPS 2-1/2 (DN 65): Size for running torque of 150 in. x lbf (16.9 N x m) and breakaway torque of 300 in. x lbf (33.9 N x m).

4. Spring-Return Motors for Valves Larger Than NPS 2-1/2 (DN 65) : Size for running and breakaway torque of 150 in. x lbf (16.9 N x m) .

B. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.

1. Valves: Size for torque required for valve close off at maximum pump differential pressure.

2. Coupling: V-bolt and V-shaped, toothed cradle.

3. Overload Protection: Electronic overload or digital rotation-sensing circuitry.

4. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on nonspring-return actuators.

5. Power Requirements (Two-Position Spring Return): 120 -V ac.

6. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.

7. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.

8. Temperature Rating: 40 to 104 deg F (5 to 40 deg C).

9. Run Time: 12 seconds open, 5 seconds closed.

2.09 CONTROL VALVES

A. Control Valves: Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.

B. Hydronic system globe valves shall have the following characteristics:

1. NPS 2 (DN 50) and Smaller: Class 125 bronze body, bronze trim, rising stem, renewable composition disc, and screwed ends with backseating capacity repackable under pressure.

2. NPS 2-1/2 (DN 65) and Larger: Class 125 iron body, bronze trim, rising stem, plug-type disc, flanged ends, and renewable seat and disc.

3. Internal Construction: Replaceable plugs and stainless-steel or brass seats.

   a. Single-Seated Valves: Cage trim provides seating and guiding surfaces for plug on top and bottom.

   b. Double-Seated Valves: Balanced plug; cage trim provides seating and guiding surfaces for plugs on top and bottom.

4. Sizing: 5-psig (35-kPa) maximum pressure drop at design flow rate or the following:

   a. Two Position: Line size.

   b. Two-Way Modulating: Either the value specified above or twice the load pressure drop, whichever is more.

   c. Three-Way Modulating: Twice the load pressure drop, but not more than value specified above.

5. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.

6. Close-Off (Differential) Pressure Rating: Combination of actuator and trim shall provide minimum close-off pressure rating of 150 percent of total

system (pump) head for two-way valves and 100 percent of pressure differential across valve or 100 percent of total system (pump) head

C. Butterfly Valves: 200-psig (1380-kPa) , 150-psig (1034-kPa) maximum pressure differential, ASTM A 126 cast-iron or ASTM A 536 ductile-iron body and bonnet, extended neck, stainless-steel stem, field-replaceable EPDM or Buna N sleeve and stem seals.

1. Body Style: Wafer.

2. Disc Type: Nickel-plated ductile iron

3. Sizing: 1-psig (7-kPa) maximum pressure drop at design flow rate.

2.10 CONTROL CABLE

A. Control wiring for 24 volt circuits shall be insulated copper 18 AWG minimum and shall be rated for 300 VAC service.

B. Analog signal wiring shall be 18 AWG single or multiple twisted pair. Each cable shall be 100 per cent shielded and have 20 AWG drain wire. Each wire shall have insulation rated to 300 VAC. Cables shall have an overall aluminum-polyester or tinned-copper (cable-shield tape), overall 20 AWG tinned copper cable drain wire and overall cable insulation rated to 300 VAC. Install analog signal wiring in conduit separate from AC power circuits. Circuits operating at more than 100 volts shall be in accordance with DIVISION 16 Electrical

C. Optical cables shall be duplex 900 mm tight-buffer construction designed for intra-building environments. Sheath shall be UL listed OFNP in accordance with NEC Article 770. Optical fiber shall meet the requirements of FDDI, ANSI X3T9.5 PMD for 62.5/125mm. Field terminate optical fibers with ST type connectors. Connectors shall have ceramic ferrules and metal bayonet latching bodies.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that power supply is available to control units and operator workstation.

B. Verify that pneumatic piping and duct-, pipe-, and equipment-mounted devices are installed before proceeding with installation.

3.02 INSTALLATION

A. Install software in control units and operator workstation(s). Implement all features of programs to specified requirements and as appropriate to sequence of operation.

B. Connect and configure equipment and software to achieve sequence of operation specified.

C. Install labels and nameplates to identify control components. Nameplates shall be permanently attached to HVAC control panel doors. For each field mounted piece of equipment, a plastic or metal engraved tag with equipment name and point identifier shall be attached.

3.03 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install raceways, boxes, and cabinets according to Division 26 for Raceways and Boxes.

B. Install building wire and cable according to Division 26 - ELECTRICAL.

C. Install signal and communication cable as indicated below:

1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.

2. Install exposed cable in raceway.

3. Install concealed cable in raceway.

4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.

5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.

6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.

7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.

D. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative and perform a points verification test (PVT) to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.

2. Test and adjust controls and safeties.

3. Test calibration of electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.

4. Test each point through its full operating range to verify that safety and operating control set points are as required.

5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.

6. Test each system for compliance with sequence of operation.

7. Test software and hardware interlocks.

8. Every point on the points list shall be tested and verified that it is connected and identified to the correct equipment and programmed to the correct functions. This shall be performed through the points verification test (PVT) report.

C. DDC Verification:

1. Verify that instruments are installed before calibration, testing, and loop or leak checks.

2. Check instruments for proper location and accessibility.

3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.

4. Check flow instruments. Inspect tag number and line and bore size, and verify that inlet side is identified and that meters are installed correctly.

5. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.

6. Check temperature instruments and material and length of sensing elements.

7. Check control valves. Verify that they are in correct direction.

8. Check air-operated dampers. Verify that pressure gages are provided and that proper blade alignment, either parallel or opposed, has been provided.

9. Check DDC system as follows:

   a. Verify that DDC controller power supply is from emergency power supply, if applicable.

   b. Verify that wires at control panels are tagged with their service designation and approved tagging system.

   c. Verify that spare I/O capacity has been provided.

   d. Verify that DDC controllers are protected from power supply surges.

D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.05 ADJUSTING

A. Calibrating and Adjusting:

1. Calibrate instruments.

2. Make three-point calibration test for both linearity and accuracy for each analog instrument.

3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.

4. Control System Inputs and Outputs:

a. Check analog inputs at 0, 50, and 100 percent of span.

b. Check analog outputs using milliampere meter at 0, 50, and 100 percent output.

c. Check digital inputs using jumper wire.

d. Check digital outputs using ohmmeter to test for contact making or breaking.

e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.

5. Flow:

a. Set differential pressure flow transmitters for 0 and 100 percent values with 3-point calibration accomplished at 50, 90, and 100 percent of span.

b. Manually operate flow switches to verify that they make or break contact.

6. Pressure:

a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.

b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.

7. Temperature:

a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.

b. Calibrate temperature switches to make or break contacts.

8. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.

9. Provide diagnostic and test instruments for calibration and adjustment of system.

10. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.

B. Adjust initial temperature set points.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other than normal occupancy hours for this purpose.

3.06 TRAINING

A. The controls contractor shall provide the following training services:

1. One (1) day of on-site orientation by a field engineer who is fully knowledgeable of the specific installation details of the project.

This orientation shall, at a minimum, consist of a review of the project as-built drawings, the control system software layout and naming conventions, and a walk through of the facility to identify panel and device locations.

2. General: Provide training course schedule, syllabus, and training materials 15 days prior to the start of training. Conduct training courses for designated personnel in the maintenance and operation of the HVAC and DDC system. Orient training to the specific system being installed under this contract. Use operation and maintenance manual as the primary instructional aid. Operational and maintenance manuals shall be provided for each trainee with four additional sets, two sets delivered for archiving at the project site, one set for the mechanical contractor, and one set for the design engineer. Training manuals shall include an agenda, defined objectives and a detailed description of the subject matter for each lesson. Furnish audio-visual equipment and all other training materials and supplies. A training day is defined as 8 hours of classroom or lab instruction, excluding break and lunch periods, Monday thru Friday, during the daytime shift in effect at the training facility. For guidance, assume the attendees will have a high school education and are familiar with HVAC systems. The minimum amount of training for this project shall be 24 hours.

3. Operator Training: Operator training shall include the detailed review of the control installation drawings, points list, and equipment list. The instructor shall then walk through the building identifying the location of

the control devices installed. For each type of systems, the instructor shall demonstrate how the system accomplishes the sequence of operation.

4. From the workstation, the operator shall demonstrate the software features of the system. As a minimum, the operator demonstrate and explain logging on, setting passwords, setting up a schedule, trend, point history, alarm, and archiving the database.

5. Maintenance Training: The system maintenance course shall be taught at the project site within one month after the completion of the operators training. The course shall last for one 8 hour training day. The course shall include answering questions from the last training session, trouble shooting and diagnostics, repair, instructions, preventive maintenance procedures and schedules, and calibration procedures.

END OF SECTION

SECTION 15910 - DUCT ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes dampers, fire dampers, smoke dampers, combination fire/smoke dampers, sound attenuators, access doors, and flexible connections used in duct systems.

1.02 QUALITY ASSURANCE

A. Construct and test fire dampers in accordance with UL Standard 555. Each fire damper shall have a 1-1/2 or 3-hour UL fire protection rating, as required, and shall include a UL label in accordance with established UL labeling procedures. Fire dampers shall be State Fire Marshal listed.

B. Construct fire damper fusible links to UL Standard 33, Fusible Links for Fire Protection Service, for service intended.

C. Smoke dampers and combination smoke/fire dampers shall be classified by UL as a leakage rated damper for use in smoke control systems, under UL 555 S, and shall bear a UL label attesting to same and shall be State Fire Marshal listed.

D. Demonstrate resetting of fire dampers to authorities having jurisdiction and Owner's Representative.

E. Match duct accessories materials with duct system materials specified in Section 15890 Ductwork. Metal gauges specified herein may be decreased in accordance with SMACNA standards for stainless steel components.

F. Accessories shall meet the requirements of NFPA 90 A and NFPA 101, as applicable. Fire and fire/smoke dampers shall be approved by the State Fire Marshal.

G. Fabricate in accordance with ASHRAE Handbooks and SMACNA duct manuals.

1.03 SUBMITTALS

A. Provide submittals in accordance with provisions of Division 1.

B. Submit shop drawings of factory fabricated assemblies.

C. Submit manufacturer's printed installation instructions.

D. Provide a field mock-up smoke damper installation complete with wall framing, wallboard, wall opening filler pieces, perimeter mounting angles, sleeve, breakaway duct connections, and access door. Obtain Architect's approval of mockup prior to starting damper installation.

E. Provide a field mockup of proposed contractor fabricated balancing dampers.

F. Submit static pressure drop data for each smoke and fire/smoke damper for actual installation conditions. Select damper not to exceed .1" sp drop. Size of damper shall be larger or the same size as the ductwork. Provide ductwork transitions and larger damper to satisfy static pressure drop requirements.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Combination Fire/Smoke Dampers:

1. Ruskin
2. Greenheck
3. Air Balance
4. Prefco
5. Pottorff

B. Balancing Dampers:

1. Ruskin
2. Air Balance
3. Greenheck
4. Pottorff

C. Control Dampers:

1. Ruskin
2. Air Balance
3. Greenheck
4. Pottorff

D. Access Doors - Ductwork:

1. Ruskin
2. Duct Mate
3. Vent Fabrics
4. Kees

2.02 ACCESS DOORS - DUCTWORK

A. Construction: Close fitting rigid galvanized steel assemblies with sealing gaskets. For insulated ductwork, install minimum 1-inch thick insulation with sheet metal cover.

B. Locking Devices: Provide 2 hinges and 2 sash locks for sizes up to 18 inches square; 2 hinges and 2 compression latches with outside and inside handles for sizes up to 24 inches x 48 inches. Provide an additional hinge for larger sizes.

2.03 BALANCING DAMPERS

A. General: Provide dampers throughout the duct systems to facilitate complete balancing.

B. Rectangular Dampers With Either Height Dimension Less Than 12 inches: SMACNA Figure 2-12 shall be followed for dampers up to 12 inches in height.

C. Rectangular Dampers With Height Dimension Between 12 and 24 inches:

1. Butterfly type dampers with 18 gauge galvanized steel or duct casing angle reinforced as required.

2. Provide single thickness 16 gauge minimum, galvanized steel blades, welded or bolted to 1/2 inches minimum diameter through shaft. Permanently mark end of shaft to indicate blade position and fit with a locking quadrant mounted on outside of frame. Bearings shall be pressed into frame and designed for dynamic requirements.

D. Rectangular Dampers with both width and height dimensions greater than 24 inches:

1. Frame, 5 inches by 1 inch, 16 gauge galvanized steel channel. Blades, 8 inches maximum width, 18 gauge galvanized steel, opposed blade, having shafts/bearings designed to meet dynamic requirements, positively locked to shafts.

2. Control shaft shall be 3/8 inch square, plated steel, permanently marked to indicate blade position, and fitted with locking quadrant mounted on outside of frame.

3. Pressure drop for a 28 inches by 28 inches damper handling 7600 CFM shall be 0.05 inch wg or less under standard air conditions.

4. Dampers shall be Ruskin MD15 or equal.

E. Identification: Provide 1 inch wide nylon ribbon for each damper, color as follows: supply air, red; return air, blue; exhaust air, yellow. Tie through hole at end of damper quadrant, leaving at least 12 inches of ribbon hanging free. Attach ribbons at the time each damper is installed. Provide additional white ribbons to any fire damper used for balancing.

2.04 CONTROL DAMPERS

A. Factory fabricated and size by automatic control system manufacturer or supplied with air handling equipment

1. Suitable for air velocities in systems.

2. Airfoil, single or multi-blades, 6” wide, 16 gauge galvanized steel with neoprene edge seal.

3. All linkages shall be ganged together for opposed blade operation, bronze sleeve or Teflon bearings. Minimum ½" continuous rods.

4. Galvanized steel channel frame construction with maximum sectional width of 48 inches per section.

5. A single actuator shall not operate more than 16 square feet of damper area unless actuator is listed otherwise.

B. Leakage when closed: Guaranteed less than 10 cfm per sq. ft. at 4 inch wg static pressure.

C. Ruskin model CD-60 or equal.

2.05 DUCT AIRFLOW MEASURING STATIONS AND TRANSMITTERS

A. Duct Air Flow Measuring Station: Refer to specification Section 15900 HVAC Instrumentation and Controls.

2.06 FLEXIBLE CONNECTIONS

A. Fabricate of neoprene coated flameproof fabric tightly crimped into metal edging strip and attach to ducting and equipment by screws or bolts at 6 inches intervals. Flexible duct connections shall be provided with a sufficient material width to prevent interference with free operation of fan vibration isolation systems.

2.07 BACKDRAFT DAMPERS

A. Extended aluminum construction with counter balanced vinyl blade edge seals, blade ends overlapping frames and control balance assembly.

PART 3 - EXECUTION

3.01 APPLICATION

A. Access Doors: Provide for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, smoke dampers, combination fire/smoke dampers, before humidifiers and duct heating coils at turning vanes, splitter dampers. In addition, provide access doors at minimum 50 feet on center in duct runs to facilitate cleaning.

Review locations prior to fabrication. Doors shall be square, sized to 3/4 of the larger of the duct width or height, but no smaller than 8 inches x 8 inches nor no larger than 24 inches x 24 inches.

B. Fire Smoke Dampers: Provide at locations, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Provide fire dampers complete with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings, and hinges. Fire damper units having dampers, sleeves,

angles, and breakaway duct connections constructed as an integral unit shall be acceptable if UL labeled as an assembly.

C. Balancing Dampers, Low Pressure: Provide balancing dampers at all points where supply, return, and exhaust systems submains, branch mains, and branches are taken from larger ducts, and as shown in typical details, drawings, and diagrams. Do not use splitter dampers except where specifically indicated on Drawings.

D. Flexible Connections: Provide immediately adjacent to equipment in ducts associated with fans and equipment subject to forced vibration. In addition, provide flexible connections where ductwork crosses building expansion joints and where ductwork crosses separations between new and existing construction.

3.02 INSTALLATION

A. Install items in accordance with manufacturer's printed instructions and SMACNA standards.

B. Sound attenuators shall be installed as shown on Drawings and supported from structural members in accordance with manufacturer's recommendations. No rigid connection shall exist between sound attenuators and partitions, walls, ceilings, etc.

C. For connections to medium and high pressure fans, install 1/8 inch thick neoprene pad over fabric and hold in place with additional metal strips.

D. Locate duct access doors for easy access. Locate doors above accessible ceilings whenever possible. Coordinate locations of ceiling access doors with ceiling installer and with other trades such that conduit and pipe does not prevent or interfere with access to ductwork. Refer to Section 15010 Mechanical General Requirements, for access door requirements in ceilings and walls.

E. Install duct airflow stations in locations shown on Drawings and comply with manufacturer's installation instructions.

F. Mount damper operators, control devices, thermometers, and gauges upon extension brackets or devices to prevent interference with insulation or vapor barrier integrity.

3.03 DUCT SMOKE DETECTORS

A. Unit shall be supplied and wired by Division 16 and shall be installed in the supply air handling units only under this section in accordance with manufacturer listing requirement.

END OF SECTION

SECTION 15990 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.01 SUMMARY

A. This work shall be performed by an independent firm certified either the National Environmental Balancing Bureau (NEBB) or the Associated Air Balance Council (AABC).

B. This section includes total system balance, as defined by AABC or NEBB, which constitutes the process of testing, adjusting, and balancing each system component so that the entire system produces the results for which it was designed. Testing results of total system balance shall be accepted by the Mechanical Engineer of Record and Owner.

C. Work shall include the proper use of instruments, evaluation of readings, adjusting the systems to design conditions, full implementation of all AABC/NEBB test report forms, and providing unbiased opinions of the deficiencies encountered and proposing corrective action.

D. Procure the services of an independent contractor qualified in TAB as defined in Chapter 34 of the 2011 ASHRAE Handbook - HVAC Application. The TAB work shall include the following:

1. Exhaust Fans

2. HVAC Ductwork

3. Chilled water Air Handling units and fan coil units

4. Controls and control components

5. Sound and vibration measurements

6. HVAC Reheat coils and controls components.

E. Air and water distribution systems shall be balance according to construction phasing and final system.

F. Test and Balance contractor shall provide necessary labor and material to support commissioning activities.

1.03 QUALITY ASSURANCE

A. The following references and standards are applicable to the testing, adjusting, and balancing of mechanical equipment and systems and shall form a part of this Section. Publication references are to the latest issue of each, together with related additions and/or amendments pertaining thereto, as of the date of contract or purchase order. Sponsoring agency references are made in accordance with the following abbreviations:

1. AABC: Associated Air Balance Council
2. NEBB: National Environmental Balancing Bureau
3. ADC: Air Diffusion Council
4. AMCA: Air Moving and Conditioning Association
5. ANSI: American National Standard Institute
6. ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers
7. ASNT: American Society for Nondestructive Testing

B. "National Standards for Total System Balance: Air Distribution, Hydronic Systems, Air Pollution, Sound and Vibration"; published by AABC.

C. AMCA Publication 203, "A Guide to the Measurement of Fan System Performance in the Field."

D. ASHRAE HVAC Applications Handbook, Chapters 34 and 42 as applicable.

E. ADC Test Code No. 1062, "Equipment Test Code."

F. ANSI A 1.4, Specification for Sound Level Meters.

G. ANSI S1.11, Specification for Octave, Half-Octave, and Third-Octave Band Filter Sets.

H. "Procedural Standards for Testing; Adjusting, Balancing of Environmental Systems," published by NEBB.

I. TAB personnel shall be qualified and certified in the following generic TAB categories:

1. Air Systems and Associated Equipment.
2. Hydronic Systems and Associated Equipment.
3. Sound.
4. Vibration.

J. Supervision means that tests performed under this contract in any of TAB categories stated herein shall be under the direction and supervision of one or more qualified supervisor(s) as defined by the NEBB or AABC on the Job Site.

1.04 SUBMITTALS

A. Submittals shall be provided in accordance with provision of Division 1.

B. Provide submittals in accordance with provisions of Division 1.

C. The TAB contractor shall perform equipment and systems tests, compile test data, and submit reports to the Engineer. Specific procedures used in tests shall be performed in strict accordance with AABC or NEBB requirements and shall be included in the test report. Contractor shall identify equipment by Drawing identification code.

D. Submit data on printed report forms published by AABC or NEBB.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.01 PROJECT REVIEW

A. Pre-Construction Review:

1. Review following documents:
    a. Contract documents:
        1) Drawings.
        2) Specifications.
        3) Addenda.
    b. Submittal data.
    c. Shop drawings.
    d. Temperature control drawings.
2. Assure that design intent is clearly understood.
3. Identify potential problems from standpoint of total system balance.
4. Review of specifications for:
    a. Scope of work.
    b. Special requirements.
    c. Items that will make balancing difficult or impossible.

5. Review of drawings for:
    a. Potential problems for total system balance.
        1) Location of balancing devices.
        2) Lack of balancing devices.
        3) General System layout.
        4) Architectural features.
        5) Accessibility.
    b. Most effective system balance procedures.
    c. Scheduling and coordination requirements.
6. Review of submittal data for:
    a. Completeness of data.
    b. Conformity with contract documents.
    c. Special instructions for use of balancing devices.
    d. Factors for flow meters.
    e. Limitations affecting accuracy of measurements.
    f. Equipment performance data and curves.
7. Review of shop drawings for:
    a. Potential problems for total system balance, as specified above for review of contract drawings.
8. Review of temperature control drawings for
    a. Thorough understanding of system functions.
    b. Determining most effective total system balance procedure for minimum control manipulation.
        1) Avoid disturbing calibration of control devices.
    c. Coordinate required control manipulation with control contractor.
9. Submit for clarification any deficiencies observed during pre-construction review.

a. Submit report recommending addition and/or relocation of balancing devices, including, but not limited to:

1) Volume dampers.

2) Balancing valves.

3) Flow metering devices, for air and water.

4) Pressure and temperature measuring points.

b. During final testing and balancing, furnish valves or other device not specified, shown, or noted in preconstruction review submittal, which is necessary for a total system balance at no additional cost to the Owner.

B. Construction Review:

1. Make on-site visits during progress of construction.

A. Number of visits to be as required to perform the functions specified below.

2. Purpose of review:

a. Identify potential problems for performing total system balance.

b. Identify modifications which will affect air total system balance.

c. Schedule and coordinate total system balance with other work.

d. Identify conditions that could create hazardous environment for building occupants.

3. Typical activities:

a. Check that necessary balancing and measuring hardware is in place, and:

1) Located properly and accessibly.

2) Installed correctly.

B. Identify and evaluate variations from system design.

C. Record data from equipment nameplates.

D. Identify and report possible restrictions in systems; such as:

1) Questionable piping connections.

E. Verily that construction progress will not delay total system balance.

F. Identify scaffolding needs.

3.02 INSTRUMENTS

A. Instruments used in testing mechanical systems and equipment shall be as recommended by the AABC, NEBB, AMCA, or ASHRAE. Test instruments used shall be initially and periodically checked thereafter to verify their calibration accuracy as described in AABC or NEBB procedures. Provide calibration verification of each test instrument with each test report.

B. Test equipment shall be furnished by the contractor and shall remain his property.

3.03 GENERAL PROCEDURES

A. Systems and equipment as listed in the Specifications shall be tested and balanced in accordance with qualified procedures from the AABC or NEBB Standards.

B. Procedures for each system test and equipment test shall be maintained on file by the contractor and shall be readily available to the Engineer if requested.

C. Procedures used in tests shall be included in the submitted report.

D. TAB contractor shall coordinate with the controls contractor for setting and/or positioning of control devices pertinent to facilitating testing and adjustment of all mechanical systems.

E. Piping: Remove from systems, during testing, equipment which would be damaged by test pressure. Replace removed equipment after testing. Systems may be tested in sections as work progresses. However, any previously tested portion shall become part of any later test of composite system. Correct leaks by remaking joints with new material; makeshift remedies will not be permitted. Test time will be accrued only while full test pressure is on system. Do testing before backfilling or concealing.

F. Test systems per following schedule. If not scheduled, minimum test pressures are 150 percent of indicated system working or static pressure. Unless indicated otherwise, “Tolerance” shall be no pressure drop, except that due to a temperature change, in 24-hours period. Heating and ventilating Contractor(s) shall test as often as necessary to prevent delay of other trades.

Test Schedule			
Test System	Test Pressure	Medium	Duration/Hours at Test Pressure
Potable water	150	Water	4
Domestic Hot Water	150	Water	4
Chilled Water	150	Water	4
Waste	10’ head	Water	

Test Schedule			
Test System	Test Pressure	Medium	Duration/Hours at Test Pressure
Vent	10’ head	Water	No leak 1hr
Storm Drain	10’ head		No leak 1hr
Refrigeration Piping (suction and liquid)	250	Air	4

G. General Testing Procedures:

1. Valves:

   a. General Service Valves: Test bonnets for tightness. Test-operate from closed-to-open-to-closed position while under test pressure.

   b. Automatic Valves: Test solenoid valves, water-regulating valves, and pressure-reducing valves for proper operation at settings indicated.

   c. Water Safety Valves: Test relief valves, safety relief valves, safety valves, and temperature and pressure-relief valves three times.

2. Piping Specialties:

   a. Test thermometers, pressure gauges and water meters for accurate indication; automatic water feeders, air vents, and vacuum breakers for proper performance.

   b. Test air vent point to insure air has been vented.

   c. Test other piping specialties for proper operation.

3. Hangers and supports: With systems in normal operation, test hangers, supports and rods to insure they are plug and supporting proper share of load. Additionally support, as required, systems and equipment that sway, crawl, or vibrate.

4. Temperature control: Test control functions to assure that systems are controlling as required, and that controls are adjusted to maintain proper room temperatures. Manufacturer’s representative shall perform tests.

5. Other material and equipment: Test equipment for proper rotation. Test other materials and equipment as specified, as recommended by equipment manufacture, and as otherwise necessary or directed by Engineer to assure that they are complete, operable, and ready for use.

6. Ductwork specialties: Check that fire dampers are 100% open.

H. Pipe pressure testing shall be witnessed by the site Inspector of Record (IOR)

3.04 DUCTWORK TESTING

A. General:

1. Test randomly selected sections of representative ductwork and plenums for leaks, using a portable high pressure blower and necessary instrument.

2. Ductwork: Examine air handling or fan-coil systems and clear any obstruction and debris. With dampers wide open and closed, run fan systems and check for air leaks.

3. Patch, repair or replace ductwork as required. All ductwork shall be made airtight. Repair or replace ducts and joints as required to the satisfaction of the Engineer.

4. All ducts except medium pressure duct: Cap section ends and pressurize to 2" W.C, for 10 minutes.

B. Ductwork pressure testing shall be witnessed by the site Inspector of Record (IOR). Measurement shall be recorded and signed by the IOR and submitted to Architect for Record.

3.05 COMPONENT CHECKOUT

A. All components such as fans, pumps, boilers, chillers, unitary equipment, etc., shall be checked-out prior to system balancing. Items required to be checked-out by factory representatives in other sections of Division 15 are exempted from this checkout provision. The check-out shall prove that each component is properly installed and functional. Checkout of each component shall be witnessed by the facility engineer. A written record of each component checkout shall be part of the balance report.

1. All equipment shall be checked-out according to the manufacturer's recommendations and the following checkout list:

a. Pre-Start-up Inspection

1) Verify proper equipment mounting and setting

2) Verify that control, interlock, and power wiring is complete

3) Verify alignment of motors and drives

4) Verify proper piping connections and accessories

5) Verify that lubrication is completed.

b. First Run Observations

1) Verify direction of rotation

2) Verify setting of safety controls

3) Monitor heat buildup in bearings

4) Check motor loads against nameplate.

c. Equipment Check

1) Verify proper overload heater sizes

2) Verify function of safety and operating controls

3) Verify proper operation of equipment

4) Report on inspection, observation, and checking procedures.

B. All subsystems shall be checked-out prior to system balancing according to the following checkout list, where applicable:

1. Instrumentation installation is completed.

2. Hydronic systems have been cleaned and filled with heat transfer fluid.

3. Refrigeration systems have been leak tested, evacuated, and filled with refrigerant and fresh oil.

4. Equipment checkout completed.

5. Stuffing boxes and packing glands on pumps and valves have been adjusted.

6. Rotation of electric motor and ratings of overload heaters have been verified.

7. Rotating equipment has been aligned and belt-drive tension has been adjusted.

8. Control diagrams and sequences have been connected to “as-built.”

9. Set points of safety and operating controls are as designed, and automatic control sequences have been checked.

10. Installation has been cleaned-up and temporary coverings, stickers, and tags have been removed.

11. Painted finishes have been touched-up where damaged.

12. Equipment and piping identification work has been completed with valve tags, schedules, and piping identification system.

13. Fins on extended-surface heat-transfer coils have been combed-out where damaged.

14. One set of operating and maintenance manuals has been prepared especially for use by testing and balancing technicians.

15. Building operating and maintenance personnel have been instructed in all aspects of system operation and maintenance.

16. Graphic operational data such as start/stop instructions, valve-tag schedules, and piping-identification schedules have been provided where needed.

17. Water-treatment program has been implemented, with initial qualitative testing of fluids in systems and domestic water supply, check of chemical-feeder equipment, and instructions to chemical supplier as to results desired.

18. Air distribution products installation is completed.

19. Filter installation is completed.

3.06 AIR SYSTEM BALANCING

A. Design Conditions:

1. As indicated in Drawing Schedule.

2. Design conditions shown above are +2 degrees.

B. Air quantity in main ducts shall be measured by pilot-tube traverse of entire cross-sectional area of duct. Where necessary for proper balancing, similar measurements shall be made in branch ducts. Openings in ducts for pilot-tube insertion shall be sealed with approved plugs. Outlet and inlet air quantities shall be determined in accordance with outlet and inlet manufacturers' recommendations.

C. Total air quantities shall be obtained by adjustment of fan speeds, adjustable pitch, and controllable pitch fan blades. Provide fan drives (sheave) changes required. Branch duct air quantities shall be adjusted by volume dampers. Dampers shall be permanently marked after air balance is complete.

D. Volume dampers in outlet registers may be used to balance air quantities at outlets and inlets, providing final adjustments do not produce objectionable drafts or sound levels. Air-quantity adjustments by outlet deflectors will not be permitted.

E. For systems handling outside air, system shall be balanced at normal "minimum outside air" condition. Where such systems are required to deliver 100-percent return air or a variable amount of outside air, as indicated in specifications for automatic temperature control sequences, total cfm test shall be repeated for 100-percent return air and maximum outside air shall agree with conditions found under maximum outside air operation before system is considered to be in balance. Adjustments of proper dampers shall

be made to achieve balance and marked so that control systems contractor may set damper motors accordingly.

F. Adjusting of individual outlets shall be performed under procedures recommended by manufacturers of outlets or as otherwise approved by supply air and return air dampers shall be adjusted and set for design cfm indicated. My required changes in air patterns or settings necessary to achieve correct air balance and to minimize drafts shall be performed by balancing subcontractor.

G. Measure static air pressure conditions on air supply units, including filter and coil loading and total pressure across the fan. Make allowance for 50 percent loading of filters.

3.07 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

G. Accomplish complete air balance before actual water balance begins.

H. Submit written verification that items listed above have been completed.

3.08 INSTALLATION TOLERANCES

A. Adjust air handling systems to plus or minus 5 percent for supply, return and exhaust systems from figures indicated.

B. Adjust hydronic systems to plus or minus 5 percent of design conditions indicated.

C. Indicate system air leakage loss.

3.09 AIR EQUIPMENT DATA COMPILATION:

A. Air-Moving Equipment Data:

1. Fan or unit number.
2. Location.
3. Area served.
4. Manufacturer.
5. Model number and serial number.
6. Design and actual air-flow measurements:
    a. Total cfm.
    b. Return air cfm.
    c. Outdoor air cfm.
    d. Total/external static pressure in wg.
    e. Approximate suction static pressure in wg.
    f. Approximate discharge static pressure in wg.
    g. Fan rpm.

B. Rated and Actual Motor Data:

1. Horsepower.
2. Phase.
3. Voltage.
4. Amperage.

C. Duct Velocity Traverse Data

1. Fan or unit Number.
2. Design and Actual cfm.
3. Duct division signs and area.
4. Design and actual average velocity.
5. Duct static pressure average velocity.

6. Traverse location.

7. Traverse measurements in fpm (show grid pattern).

D. Individual Outlet and Inlet Data:

1. Identify each outlet for location, area, and fan or unit system.

2. Outlet or inlet manufacturer and type.

3. Outlet or inlet size, effective area or Ak factor.

4. Design and actual velocity in fpm.

5. Design and actual cfm.

3.10 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

E. Effect system balance with automatic control valves fully open to heat transfer elements.

F. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

G. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

H. Accomplish complete air balance before actual water balance begins.

I. Submit written verification that items listed above have been completed.

3.11 VIBRATION TESTS

A. General:

1. The TAB contractor shall perform vibration tests on all rotating and air handling units, and exhaust fans.

2. Equipment and systems must be tested, adjusted and balanced prior to vibration testing of the equipment in that system.

B. Instruments: Reed vibrometers, vibrometers, vibration meters, vibrographs, and vibration analyzers are the various types of instruments available for measuring frequency and/or amplitude. In addition to the conventional instruments (stethoscopes, tachometers, and strobo-scopes) the TAB contractor shall have, as a minimum, an instrument which measures both amplitude and frequency. The choice of instrumentation is a function of the type of testing to be performed. Specific instrumentation used in a test shall be subject to review by the Engineer.

C. Procedures: The following steps should be followed to assure that equipment vibration is properly tested:

1. Determine operating speeds of equipment from nameplates, Drawings, or speed measuring devices such as tachometers or strobes and indicate on test form. For any equipment where driving speed (motor) is different from driven speed (fan wheel, rotor, impeller) because of belt driver or gear reducers, indicate both driving and driven speeds.

2. Assure that vibration isolation system is installed and functioning properly.

3. Operate equipment and make visual and audible check for an apparent rough operation. Check all bearings with stethoscope. Correct any condition of defective bearings, misalignment, or obvious rough operation before proceeding further. If not corrected, equipment may be considered unacceptable.

4. Make vibration measurements in all 3 axes at each bearing location (horizontally, vertically and axially). Measure overall peak-to-peak displacement in the frequency range of 2 to 100 Hz and report to the Engineer.

5. Evaluating Vibration Measurements: Frequency and amplitude measurements shall be evaluated as follows:

   a. For rotating equipment, unless specified otherwise, amplitude measurements at the driving and driven speeds shall not exceed the ASHRAE recommended equipment vibration criteria (see ASHRAE HVAC Applications Handbook, 1991, Chapter 42, Table 33) taking into consideration reduced values for equipment installed on inertia blocks. For example, with a belt-driven fan operating at 800 rpm and having an 1800 rpm driving motor, the amplitude measurements at fan bearings must be in accordance with values for 800 rpm, and measurements at the motor bearings must be in accordance with values for 1800 rpm. If measurements at motor bearings exceed listed values, take measurements of motor only with belts removed to determine if there is feedback vibration from the fan. Measurements which exceed acceptable amounts may be evaluated as explained in the ASHRAE HVAC Applications Handbook, Chapter 42, Section entitled, “Trouble Shooting,” and Chapter 34, Section entitled, “Testing for Vibration.”

b. No axial vibration measurement shall exceed the maximum radial (vertical and horizontal) vibration at the same location.

c. The presence of any vibration in excess of values published in the ASHRAE Handbook, at frequencies other than driving or driven speeds, is generally reason to rate operation unacceptable, and such vibration should be analyzed as explained in the ASHRAE Handbook.

6. Equipment not complying with ASHRAE vibration tolerances shall be corrected at the manufacturer's expense. Equipment shall then be retested and measurement results reported.

3.12 OPERATING TEST

A. After final adjustments and calibration, component performance checkout, and system balancing have been completed, the Subcontractor shall conduct a continuous, 7-hour operating test during normal working hours, from 9:00 a.m. to 4:00 p.m., in the presence of the Owner's representative. The 7-hour operating test shall be continuous without any shutdowns. If any interruptions are required for malfunctions or readjustments, the test shall be repeated from the start.

3.13 TRAINING SESSION

A. The Subcontractor shall conduct a training session during the operating test. This training session shall instruct the facility personnel in the proper operation and maintenance of all controls and operating equipment installed on the job.

B. The Subcontractor shall cause the equipment to operate from start-up through every step, phase, or condition the equipment will normally see. When possible, out-of-season operation shall be demonstrated by false loading or by adjustment of control devices.

C. All operations required for the routine and special maintenance of all equipment shall be fully described. Such items as cleaning, adjusting, and lubrication shall be explained. Factory manuals shall be referenced during this session.

D. On occasions where a factory representative must be on hand for the initial start-up of a piece of equipment in advance of the formal system training session, the factory representative shall perform the training session for that piece of equipment at that time of a minimum of 4-hours for each equipment.

3.14 WRITTEN REPORT

A. Test forms shall include the following information:

1. Each sheet shall have the building name, the name of the air conditioning Subcontractor, the instruments used to perform the test, the name of the person performing the test, the date the test was performed, and shall

include no less information than shown on the AABC or NEBB Standard Test Forms.

2. All forms shall be standard 8-1/2 x 11-inch size good quality paper, bound to form a complete report. All forms shall be typewritten or hand lettered; handwritten forms are not acceptable. Five copies shall be submitted to the contracting officer. One copy will be returned with approvals.

3. The testing and balancing agency shall include a typewritten report along with the bound test data. The report shall list specific deficiencies, if any, and recommendations for correcting the deficiencies if design changes are involved.

END OF SECTION

DIVISION 16 - ELECTRICAL

SECTION 16011 - GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. This section specifies the general electrical requirements for all labor, materials, equipment, and services provided under DIVISION 16 - ELECTRICAL.

1.02 WORK INCLUDED

A. The Contractor under this Division shall provide all labor, materials, equipment, supervision and services required for the construction of the electrical systems. The finished installations shall be complete, operable and shall include all work specified herein and shown on the Drawings.

B. The work shall include complete testing of all equipment and wiring at the completion of the work and making any minor connection changes or adjustments necessary for the proper functioning of the system and equipment. All systems shall be properly adjusted and in working order at the time of final acceptance.

C. It is the intent of these Specifications and other Contract Documents to require an installation complete in every detail. Consequently, the Contractor will be responsible for minor details or for any special construction which may be found necessary to properly furnish, install, adjust, test, and place in successful and continuous operation, the entire electrical system and the cost of same shall be included in the contract price.

1.03 DESCRIPTION OF WORK

A. Work specified in this Division shall include, but not be limited to the following:
   1. Distribution system modifications, including overcurrent protection devices, and feeders.
   2. Complete electrical system modifications including branch circuits, luminaires, switches, receptacles, outlets and control devices.
   3. Power wiring for electrically-operated equipment.
   4. Raceway/cabling system modifications for telephone, telecommunications/data, CATV, and nurse call systems.
   5. Include in the bid and pay for the permits, plan review fees, inspection fees and deliver the certificate of final inspection to Engineer.
   6. Testing.

7. Record drawings.

B. Electrical wiring system shall have sufficient capacity to accommodate all equipment and other electrical loads as specified herein and shown on the drawings and as required per National Electrical Code and other applicable codes, standards and requirements plus spare capacity to accommodate any planned future facilities and additions and minimum 25 percent spare capacity for future growth.

1.04 REFERENCES

A. The publications listed herein form a part of this specification to the extent referenced. The publications may be referred to in the text by the basic designation only. Unless otherwise indicated, the most recent edition of the publication with current revisions and amendments will be enforced.

B. Comply with the ordinances of the County having jurisdiction over this project.

C. In the event of conflict between pertinent codes and regulations, and the requirements of the referenced standards, or those indicated in Specifications and on drawings, the provisions of the more stringent shall govern.

1.05 RELATED WORK

A. DIVISION 1 - GENERAL REQUIREMENTS.

B. SECTION 09901 - PAINTING.

C. DIVISION 15 - MECHANICAL.

1.06 DEFINITIONS

A. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE 100.

B. The technical sections referred to herein are those specification sections that describe products, installation procedures, and equipment operations and that refer to this section for detailed description of submittal types.

C. The technical paragraphs referred to herein are those paragraphs in PART 2 - PRODUCTS and PART 3 - EXECUTION of the technical sections that describe products, systems, installation procedures, equipment, and test methods.

1.07 SUBMITTALS

A. Submit in accordance with SECTION 01330 - SUBMITTAL PROCEDURES.

B. Certificates:
   1. Submit written certification that electrical systems are complete and operational as stipulated in item entitled “DEMONSTRATION OF COMPLETE ELECTRICAL SYSTEMS” hereinbelow.
   2. Submit certificate of final inspection and acceptance as stipulated in item entitled “INSPECTION” hereinbelow.

C. Warranty: Submit warranty as stipulated in item entitled “WARRANTY” hereinbelow.

D. Record Drawings: After the work is complete, Contractor shall provide record drawings showing the as-built conditions in accordance with SECTION 01770 – CLOSE-OUT PROCEDURES.

E. Submittals required in the sections which refer to this section shall conform to the following additional requirements. Submittals shall include the manufacturer’s name, trade name, place of manufacture, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and technical paragraph reference. Submittals shall also include applicable industry and technical society publication references, and years of satisfactory service, and other information necessary to establish contract compliance of each item to be provided. Photographs of existing installations are unacceptable and will be returned without approval. Transmittal letter shall include a listing of all items by manufacturer and catalog number which are included in the submittal package and shall clearly identify the submittal with this project.

F. Submittals for each manufactured item shall be current manufacturer’s descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog cuts. Handwritten and typed modifications and other notations not part of the manufacturer’s preprinted data may result in the rejection of the submittal. Should manufacturer’s data require supplemental information for clarification, the supplemental information shall be submitted as specified for certificates of compliance.

G. Submittal drawings shall be a minimum of 11 inches by 17 inches in size using a minimum scale of 1/8 inch per foot, except as specified otherwise. Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate

adequate clearance for operation, maintenance, and replacement of operating equipment devices.

H. Where installation procedures or part of the installation procedures are required to be in accordance with manufacturer's instructions, submit printed copies of those instructions prior to installation. Installation of the item shall not proceed until manufacturer's instructions are received. Failure to submit manufacturer's instructions shall be cause for rejection of the equipment or material.

I. Submit manufacturer's certifications as required for products, materials, finishes, and equipment as specified in the technical sections. Certificates from material suppliers are not acceptable. Preprinted certifications and copies of previously submitted documents will not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certification shall not contain statements to imply that the item does not meet requirements specified, such as "as good as"; "achieve the same end use and results as materials formulated in accordance with the referenced publications"; or "equal or exceed the service and performance of the specified material." Certifications shall simply state that the item conforms to the requirements specified. Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official authorized to sign certificates of compliance.

J. Where equipment or materials are specified to conform to industry and technical society reference standards of organizations such as American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA), and Underwriters Laboratories Inc. (UL), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance.

K. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

L. Submit text of posted operating instructions for each system and principal item of equipment as specified in the technical sections.

M. Each submittal shall be prepared with a summary sheet attached to each copy identifying all items included in the submittal. Incomplete submittals and those without summary sheets will be returned without review.

1.08 QUALITY ASSURANCE

A. In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, “shall” had been substituted for “should” wherever it appears. Interpret references in these publications to the “authority having jurisdiction,” or words of similar meaning, to mean the Engineer. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

B. Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers’ catalogs, or brochures during the 2-year period. Where 2 or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in the technical section.

C. Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers’ factory or laboratory tests, is furnished.

D. Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

E. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70.

1.09 PERMITS AND INSPECTION

A. All permits required by local ordinances shall be obtained and paid for by the Contractor.

1.10 COORDINATION

A. Refer to all project Drawings and to all Sections of the project Specifications. Coordinate and fit all work accordingly so that all electrical outlets and equipment will be properly located and readily accessible. The Drawings indicate the relation of wiring and connections and must not be scaled for exact locations. Verify all construction dimensions at the project and make changes necessary to conform to the building as constructed. Work improperly installed due to lack of construction verification shall be corrected at the Contractor’s expense.

B. Work shall be scheduled to avoid delays, interferences, and unnecessary work. If any conflicts occur, necessitating departures from the Drawings and Specifications, details of departures and reasons therefore shall be submitted immediately for consideration by the Engineer.

1.11 DELIVERY, HANDLING AND STORAGE

A. Deliver all materials of this Division in manufacturer's original unopened packages or containers with label intact and legible.

B. Use means necessary to protect the materials of this section before, during and after installation; to protect the installed work and materials of all other trades; and to protect the original structure, work and materials of the Owner.

C. In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the Engineer and at no additional cost to the Owner.

1.12 DRAWINGS AND SPECIFICATIONS

A. Electrical system drawings are diagrammatic and symbolic. Locations of outlets, devices, raceways, apparatus, etc., shown are approximate and shall be installed with the required maintenance and code clearances and to avoid conflict with other systems and trades. Visit site and verify lineal footages required and check scales and dimensions shown on architectural drawings prior to bidding to verify locations, routing and lineal footages of electrical work required for inclusion into bid. Study the project drawings and specifications and make installation in most logical manner for eye appeal and coordination with other systems and trades. Unless dimensioned or noted otherwise, orderly configuration and visual composition are fully intended.

B. Include additional components and wiring which are not shown or specified herein but are required for proper control and operation to provide for a complete and operable system within intent indicated on the drawings and specifications.

C. Study the project drawings and specifications prior to bidding and provide additional wiring including apparatus and devices for equipment furnished by others without additional cost.

D. Relocate devices, apparatus and associated wiring including raceways, from locations shown, without additional cost, for code compliance and to avoid conflict with other systems or trades, structures, utilities and when directed before installation.

E. Equipment ratings or wire sizes that are missing or shown in error shall have adequate capacity to serve the required and future loads plus minimum 25 percent spare capacity, and be in compliance with NEC.

F. Verify voltages and other ratings of energy conversion, transformation and electrical utilization equipment prior to placing order with factory. Input voltages of equipment shall match serving utility or system voltage available.

1.13 POSTED OPERATING INSTRUCTIONS

A. Provide for each system and principal item of equipment as specified in the technical sections for use by operation and maintenance personnel. The operating instructions shall include the following:
   1. Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
   2. Start up, proper adjustment, operating, lubrication, and shutdown procedures.
   3. Safety precautions.
   4. The procedure in the event of equipment failure.
   5. Other items of instruction as recommended by the manufacturer of each system or item of equipment.

B. Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions where directed. For operating instructions exposed to the weather, provide weather-resistant materials or weatherproof enclosures. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

1.14 MANUFACTURER'S NAMEPLATE

A. Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.15 FIELD FABRICATED NAMEPLATES

A. ASTM D709. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified in the technical sections or as indicated on the drawings. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, 0.125 inch thick, white, with red center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one inch by 2.5 inches. Lettering shall be a minimum of 0.25 inch high normal block style.

1.16 ELECTRICAL REQUIREMENTS

A. Electrical installation shall conform to IEEE C2, NFPA 70, and requirements specified herein.

1.17 INSTRUCTION TO GOVERNMENT PERSONNEL

A. Where specified in the technical sections, furnish the services of competent instructors to give full instruction to designated Government personnel in the adjustment, operation, and maintenance of the specified systems and equipment, including pertinent safety requirements as required. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section.

1.18 WARRANTY

A. Installation shall be complete in every detail as specified and ready for use. Unless otherwise indicated, any items supplied by Contractor developing defects of design, construction, or quality within One year of final acceptance by Engineer shall be replaced by such new materials, apparatus or parts to make such defective portion of the complete system conform to the true intent and meaning of the Drawings and Specifications at no additional cost to the Owner. Lamps shall be warranted for fifty percent of rated lamp life.

B. The warranty shall be countersigned by the General Contractor.

PART 2 - PRODUCTS

2.01 FACTORY APPLIED FINISH

A. Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA 250 corrosion-resistance test.

PART 3 - EXECUTION

3.01 GENERAL

A. Install all electrical materials and equipment in accordance with manufacturer’s recommendations and as accepted by the Engineer for the seismic zone classification at the project site in accordance with the applicable Building Code.

B. Cut, break, drill and patch as required, to install electrical system. Repair any surface damaged or marred by notching, drilling or any other process necessary for installation of electrical work. Patch any damaged surfaces to match the existing surface.

C. All wiring and overcurrent devices for equipment furnished by other trades are sized for a contemplated equipment size. If equipment other than contemplated and indicated on the plan is provided, the Contractor shall be responsible for providing the required wiring, switches, and overcurrent devices at no cost to the Owner. The Contractor shall submit the proposed revisions to the electrical design to the Engineer for acceptance.

D. The Electrical Contractor shall coordinate his work with other trades to avoid conflicts with civil, mechanical, structural, and architectural elements of this project.

3.02 JOBSITE CONDITIONS

A. These specifications are accompanied by construction drawings including building and site plans of all trades showing locations of all feeder runs, outlets, switches, devices, and other electrical equipment. The locations are approximate and before installing, study adjacent architectural details and make installation in most logical manner. Any device may be relocated within 10 feet before installation at the direction of the Engineer without additional cost to the Owner.

B. Before installing, verify all dimensions and sizes of equipment.

C. Verify that electrical system may be installed in strict accordance with the original design, the Drawings and Specifications and the manufacturer's recommendations.

D. In the event of discrepancy, immediately notify the Engineer. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.03 CONNECTIONS TO EQUIPMENT PROVIDED BY OTHER TRADES

A. Electrical Contractor shall provide conduit, wiring and all electrical connections from building wiring to motors for ventilation, air conditioning, and other equipment, including all switches, motor protection devices, and controllers/starters as specified by other trades.

B. Electrical Contractor shall ascertain from other trades furnishing electrically-operated equipment, the exact size and type of all motors and other loads, the exact locations of such equipment and the proper point where electrical connections should be brought through the floors, ceiling or walls, as the case may be. Locations shown are diagrammatic only;

coordination of the correct locations shall be the full responsibility of the Electrical Contractor.

C. Examine Mechanical, Architectural, and other Drawings and Specifications for information concerning electrically-operated equipment and control apparatus and diagrams.

D. Install individually mounted controllers/starters furnished for motors under other Divisions. Provide and install safety switches as necessary for each such motor in accordance with the NEC.

E. All control devices and control wiring shall be provided as described in the installation manuals of equipment and/or the Drawings and Specifications of other trades and disciplines.

3.04 FIELD APPLIED PAINTING

A. Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in Section 09901 - PAINTING.

3.05 FIELD FABRICATED NAMEPLATE MOUNTING

A. Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of 2 sheet-metal screws or 2 rivets.

3.06 DEMONSTRATION OF COMPLETE ELECTRICAL SYSTEMS

A. Submit written certification that electrical systems are complete and operational. Submit certification with Contractor's request for final review.

B. At the time of final review of electrical work, demonstrate the operation of electrical systems. Provide labor, apparatus and equipment for systems' demonstration. The various tests shall be under the direction and supervision of the Engineer.

C. The Contractor shall provide all test equipment, materials, labor, and temporary power hook-ups to perform start-up and all tests as required, to obtain final field acceptance from the Owner. All tests shall be conducted in the presence of the Engineer or his representative. All test procedures shall conform to this specification and applicable standards. (ANSI, IEEE, NEMA, OSHA, NFPA, NETA, etc.)

D. The Contractor shall be responsible for all tests and test record. Testing shall be performed by and under the immediate supervision of the Contractor. Test record shall be kept for each piece of equipment. Copies shall be furnished to the Engineer for his review and/or acceptance.

E. A visual inspection of all electrical equipment, to check for foreign material, tightness or wiring and connection, proper grounding, matching nameplate charts with specification, etc., shall be made prior to actual testing.

F. After demonstration of systems, submit to the Engineer 6 sets of keys for electrical equipment locks.

3.07 INSPECTION

A. Arrange for periodic inspection by the local authorities and deliver the certificate of final inspection to the Engineer.

END OF SECTION

SECTION 16100 – ELECTRICAL WORK

PART 1 - GENERAL

1.01 SUMMARY

A. This section specifies the general electrical requirements for all labor, materials, equipment, and services provided under DIVISION 16 - ELECTRICAL.

1.02 RELATED WORK

A. SECTION 16011 - GENERAL ELECTRICAL REQUIREMENTS applies to this section with additions and modifications specified herein.

1.03 APPLICABLE PUBLICATIONS

A. The publications listed herein form a part of this specification to the extent referenced. The publications may be referred to in the text by the basic designation only. Unless otherwise indicated, the most recent edition of the publication with current revisions and amendments will be enforced.

1.04 SUBMITTALS

A. Submit in accordance with SECTION 01330 - SUBMITTAL PROCEDURES.

B. Submit shop drawings and catalog cuts of the following equipment for approval. Each submittal shall be prepared with a summary sheet attached to each copy identifying all items included in the submittal. Incomplete submittals and those without summary sheets will be returned without review.

C. Manufacturer's Catalog Data:
   1. Overcurrent protection devices.
   2. Safety switches.
   3. Luminaires.
   4. Wiring Devices.
   5. Large Junction Boxes
   6. Receptacles
   7. Load Centers

D. Reports: Submit test results for approval in report form:
   1. 600 volt wiring test.
   2. Grounding system test.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" or "must" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Engineer. Provide equipment, materials, installation, and workmanship in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

B. Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where 2 or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

C. Alternative Qualifications: Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6,000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

D. Material and Equipment Manufacturing Date: Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials shall be new and those items listed by the Underwriters' Laboratories shall bear "UL" label of approval.

B. Brand names, manufacturer's names and catalog numbers indicate the standard of design and quality required. Acceptable manufacturers for electrical apparatus include General Electric, Square D, Siemens-ITE, and Cutler-Hammer. All apparatus supplied shall bear the name of the approved manufacturer on its nameplates. Substitute materials may be used if pre-qualified prior to bidding by the Engineer.

C. Electrical equipment and luminaires shall be supplied through the manufacturer's designated representative by a local distributor.

D. Proof of compliance shall be furnished when shop drawings are submitted.

E. Where 2 or more similar type items are furnished, all shall be of the same manufacture, e.g., safety switches shall be of the same manufacturer unless otherwise noted.

F. Where electrical apparatus is to be installed outdoors, NEMA 4X stainless steel housings shall be provided, unless noted otherwise.

2.02 RACEWAYS

A. Rigid Steel Conduit: Rigid steel, zinc-coated inside and outside, for use with threaded fittings. ANSI C80.1.

B. Intermediate Metal Conduit (IMC): Rigid steel, zinc- and chromate-coated inside and outside, for use with threaded fittings. UL 1242.

C. Plastic-Coated Rigid Steel and IMC Conduit: NEMA RN1, Type 40 (40 mils thick).

D. Electrical Metal Tubing (EMT): Thin walled steel tubing, zinc-coated. ANSI C80.3.

E. Flexible Metal Conduit: Flexible steel conduit; zinc-coated inside and outside, smooth inside walls, liquid-tight with factory fittings for liquid-tight installation. Provide bushings with bonding jumper lugs for flexible conduit in excess of 6 feet in length. UL 360.

F. Rigid Nonmetallic Conduit: Polyvinyl chloride, Schedule 40.

G. Metal Surface Raceways: UL 5, two-piece painted steel, totally enclosed, snap-cover type.

H. Fittings for Metal Conduit, EMT, and Flexible Metal Conduit: UL 514B. Ferrous fittings shall be cadmium- or zinc-coated in accordance with UL 514B.

I. Fittings for Rigid Metal Conduit and IMC: Threaded-type. Split couplings unacceptable.

J. Fittings for EMT: Steel compression type.

K. Fittings for Rigid Nonmetallic Conduit: NEMA TC 3 for PVC and UL 514B.

L. Liquid-Tight Flexible Nonmetallic Conduit: UL 1660.

2.03 OPEN TELECOMMUNICATIONS CABLE SUPPORT

A. Open Top Cable Supports: Provide open top cable supports in accordance with UL 2043. Open top cable supports shall be zinc-coated steel.

2.04 OUTLET BOXES AND COVERS

A. Outlet and Small Junction Boxes: UL 514A, galvanized, if ferrous metal. UL 514C, if nonmetallic.
   1. Nominal 4 inches square, 2-1/8 inches deep exclusive of plaster ring, pressed steel.
   2. Boxes for Telecommunications outlets shall be a nominal 4-11/16 inches square, 2-1/8 inches deep exclusive of plaster ring.
   3. For Telecommunications outlets, include a minimum 3/8' deep single or two gang plaster ring unless otherwise specified.
   4. Mount outlet boxes flush in finished walls/furred chases wherever possible.
   5. Surface mounted boxes and boxes exposed to the weather shall be cast steel, type FD, prime painted and enamel finished with neoprene gasketed covers, threaded hubs for conduit connections and stainless steel screws.

2.05 CABINETS, JUNCTION BOXES, AND PULL BOXES

A. Volume greater than 100 cubic inches, UL 50, hot-dip, zinc-coated, if sheet steel.

2.06 WIRES AND CABLES

A. Wires and cables shall meet applicable requirements of NFPA 70 and UL for type of insulation, jacket, and conductor specified or indicated. Wires and cables manufactured more than 12 months prior to date of delivery to site shall not be used.

B. Conductors:
   1. Conductors No. 8 AWG and larger diameter shall be stranded.
   2. Conductors No. 10 AWG and smaller diameter shall be solid.
   3. Conductors for remote control, alarm, and signal circuits, classes 1, 2, and 3, shall be stranded unless specifically indicated otherwise.
   4. Conductor sizes and capacities shown are based on copper, unless indicated otherwise. All conductors shall be copper.
   5. Equipment Manufacturer Requirements: When manufacturer's equipment requires copper conductors at the terminations or requires copper conductors to be provided between components of equipment, provide copper conductors or splices, splice boxes, and other work required to satisfy manufacturer's requirements.
   6. Minimum Conductor Sizes:
      a. Minimum size for branch circuits shall be No. 12 AWG.
      b. Class 1 remote-control and signal circuits: No. 14 AWG.

c. Class 2 low-energy, remote-control and signal circuits: No. 16 AWG.
d. Class 3 low-energy, remote-control, alarm and signal circuits: No. 22 AWG.

C. Color Coding: Provide for feeder, branch, control, and signaling circuit conductors.
1. Color shall be green for grounding conductors and white for neutrals; except where neutrals of more than one system are installed in same raceway or box, other neutrals shall be white with a different colored (not green) stripe for each.
2. Color of ungrounded conductors in different voltage systems shall be as follows:
a. 208/120 volt, 3-phase:
1) Phase A - black.
2) Phase B - red.
3) Phase C - blue.

D. Insulation: Unless specified or indicated otherwise or required by NFPA 70, power and lighting wires shall be 600-volt, Type THWN/THHN conforming to UL 83 or Type XHHW or RHW conforming to UL 44, except that grounding wire may be type TW conforming to UL 83; remote-control and signal circuits shall be Type TW or TF, conforming to UL 83. Where lighting fixtures require 90-degree Centigrade (C) conductors, provide only conductors with 90-degree C insulation or better.

E. Bonding Conductors: ASTM B1, solid bare copper wire for sizes No. 8 AWG and smaller diameter; ASTM B8, Class B, stranded bare copper wire for sizes No. 6 AWG and larger diameter.

F. Metal-Clad Cable: UL 1569; NFPA 70, Type MC cable, Hospital Grade only.

2.07 SPLICES AND TERMINATION COMPONENTS

A. UL 486A-486B for wire connectors and UL 510 for insulating tapes. Connectors for No. 10 AWG and smaller diameter wires shall be insulated, pressure-type in accordance with UL 486A-486B or UL 486C (twist-on splicing connector). Provide solderless terminal lugs on stranded conductors.

2.08 DEVICE PLATES

A. Provide UL listed, one-piece device plates for outlets to suit the devices installed.
1. For metal outlet boxes, plates on unfinished walls shall be of zinc-coated sheet steel or cast metal having round or beveled edges.
2. For nonmetallic boxes and fittings, other suitable plates may be provided.

3. Plates on finished walls shall be nylon or lexan, minimum 0.03 inch wall thickness. Plates shall be same color as receptacle or toggle switch with which they are mounted.
4. Screws shall be machine-type with countersunk heads in color to match finish of plate.
5. Sectional type device plates will not be permitted.
6. Plates installed in wet locations shall be gasketed and UL listed for "wet locations.

2.09 SWITCHES

A. Toggle Switches: NEMA WD 1, UL 20, single pole, totally enclosed with bodies of thermoplastic or thermoset plastic and mounting strap with grounding screw.
   1. Handles shall be white thermoplastic.
   2. Wiring terminals shall be screw-type, side-wired or of the solderless pressure type having suitable conductor-release arrangement.
   3. Contacts shall be silver-cadmium and contact arm shall be one-piece copper alloy.
   4. Switches shall be rated quiet-type ac only, 120/277 volts, with current rating and number of poles indicated.

B. Breakers Used as Switches For 120- and 277-Volt fluorescent fixtures, mark breakers "SWD" in accordance with UL 489.

C. Disconnect (Safety) Switches: NEMA KS 1. Provide heavy duty-type switches where indicated, where switches are rated higher than 240 volts, and for double-throw switches. Fused switches shall utilize Class R fuseholders and fuses, unless indicated otherwise. Provide fuses as indicated. Switches serving as motor-disconnect means shall be horsepower rated. Provide switches in NEMA 1 enclosure per NEMA ICS 6, unless otherwise indicated.

2.10 RECEPTACLES

A. General: UL 498, hospital grade, grounding-type.
   1. Ratings and configurations shall be as indicated.
   . Bodies shall be of white as per NEMA WD 1.
   2. Face and body shall be thermoplastic supported on a metal mounting strap.
   3. Dimensional requirements shall be per NEMA WD 6.
   4. Provide screw-type, side-wired wiring terminals or of the solderless pressure type having suitable conductor-release arrangement.
   5 Connect grounding pole to mounting strap.
   6. The receptacle shall contain triple-wipe power contacts and double or triple-wipe ground contacts.

B. Ground-Fault Circuit Interrupter Receptacles: UL 943, hospital grade, duplex type for mounting in standard outlet box. Device shall be capable

of detecting current leak of 6 milliamperes or greater and tripping per requirements of UL 943 for Class A GFCI devices. Provide screw-type, side-wired wiring terminals or pre-wired (pigtail) leads.

2.11 PANELBOARDS

A. Provide panelboards in accordance with the following:
   1. UL 67 and UL 50 having a short-circuit current rating as indicated.
   2. Panelboards: circuit breaker-equipped.
   3. Designed such that individual breakers can be removed without disturbing adjacent units or without loosening or removing supplemental insulation supplied as means of obtaining clearances as required by UL.
   4. "Specific breaker placement" is required in panelboards to match the breaker placement indicated in the panelboard schedule on the drawings.
   5. Where "space only" is indicated, make provisions for future installation of breakers.
   6. Directories: indicate load served by each circuit in panelboard.
   7. Directories: indicate source of service to panelboard (e.g., Panel PA served from Panel MDP).
   8. Provide new directories for existing panels modified by this project as indicated.
   9. Type directories and mount in holder behind transparent protective covering.
   10. Panelboards: listed and labeled for their intended use.
   11. Panelboard nameplates: provided in accordance with paragraph FIELD FABRICATED NAMEPLATES hereinbelow.

B. Enclosure: Provide panelboard enclosure in accordance with the following:
   1. UL 50.
   2. Cabinets mounted outdoors or flush-mounted: hot-dipped galvanized after fabrication.
   3. Cabinets: painted in accordance with paragraph PAINTING.
   4. Front edges of cabinets: form-flanged or fitted with structural shapes welded or riveted to the sheet steel, for supporting the panelboard front.
   5. All cabinets: fabricated such that no part of any surface on the finished cabinet deviates from a true plane by more than 1/8 inch.
   6. Holes: provided in the back of indoor surface-mounted cabinets, with outside spacers and inside stiffeners, for mounting the cabinets with a 1/2 inch clear space between the back of the cabinet and the wall surface.
   7. Flush doors: mounted on hinges that expose only the hinge roll to view when the door is closed.
   8. Each door: fitted with a combined catch and lock, except that doors over 24 inches long provided with a three-point latch having a knob with a T-handle, and a cylinder lock.

9. Keys: two provided with each lock, with all locks keyed alike.
10. Finished-head cap screws: provided for mounting the panelboard fronts on the cabinets.

C. Panelboard Buses: Support bus bars on bases independent of circuit breakers. Main buses and back pans shall be designed so that breakers may be changed without machining, drilling, or tapping. Provide isolated neutral bus in each panel for connection of circuit neutral conductors. Provide separate ground bus identified as equipment grounding bus per UL 67 for connecting grounding conductors; bond to steel cabinet.

D. Circuit Breakers: UL 489, thermal magnetic-type having a minimum short-circuit current rating equal to the short-circuit current rating of the panelboard in which the circuit breaker shall be mounted. Breaker terminals shall be UL listed as suitable for type of conductor provided.
1. Multipole Breakers: Provide common trip-type with single operating handle. Breaker design shall be such that overload in one pole automatically causes all poles to open. Maintain phase sequence throughout each panel so that any 3 adjacent breaker poles are connected to Phases A, B, and C, respectively.
2. Circuit Breakers for HVAC Equipment: Circuit breakers for HVAC equipment having motors (group or individual) shall be marked for use with HACR type and UL listed as HACR type.

2.12 ENCLOSED CIRCUIT BREAKERS

A. UL 489. Individual molded case circuit breakers with voltage and continuous current ratings, number of poles, overload trip setting, and short circuit current interrupting rating as indicated. Enclosure type as indicated. Provide solid neutral.

2.13 MOTORS

A. Provide motors in accordance with the following:
1. NEMA MG 1.
2. Hermetic-type sealed motor compressors shall also comply with UL 984.
3. Provide the size in terms of HP or kVA, or full-load current, or a combination of these characteristics, and other characteristics, of each motor as indicated or specified.
4. Determine specific motor characteristics to ensure provision of correctly sized starters and overload heaters.
5. Motors for operation on 208-volt, 3-phase circuits shall have terminal voltage rating of 200 volts, and those for operation on 480-volt, 3-phase circuits shall have terminal voltage rating of 460 volts.
6. Motors shall be designed to operate at full capacity with voltage variation of plus or minus 10 percent of motor voltage rating.
7. Unless otherwise indicated, motors rated 1 HP and above shall be continuous duty type.

8. Where fuse protection is specifically recommended by the equipment manufacturer, provide fused switches in lieu of non-fused switches indicated.

B. High Efficiency Single-Phase Motors: Single-phase fractional-horsepower alternating-current motors shall be high efficiency types corresponding to the applications listed in NEMA MG 11. In exception, for motor-driven equipment with a minimum seasonal or overall efficiency rating, such as a SEER rating, provide equipment with motor to meet the overall system rating indicated.

C. Premium Efficiency Polyphase Motors: Polyphase motors shall be selected based on high efficiency characteristics relative to typical characteristics and applications as listed in NEMA MG 10. In addition, continuous rated, polyphase squirrel-cage medium induction motors shall meet the requirements for premium efficiency electric motors in accordance with NEMA MG 1, including the NEMA full load efficiency ratings. In exception, for motor-driven equipment with a minimum seasonal or overall efficiency rating, such as a SEER rating, provide equipment with motor to meet the overall system rating indicated.

D. Motor Sizes: Provide size for duty to be performed, not exceeding the full-load nameplate current rating when driven equipment is operated at specified capacity under most severe conditions likely to be encountered. When motor size provided differs from size indicated or specified, make adjustments to wiring, disconnect devices, and branch circuit protection to accommodate equipment actually provided. Provide controllers for motors rated 1 HP and above with electronic phase-voltage monitors designed to protect motors from phase-loss, undervoltage, and overvoltage. Provide protection for motors from immediate restart by a time adjustable restart relay.

E. Wiring and Conduit: Provide internal wiring for components of packaged equipment as an integral part of the equipment. Provide power wiring and conduit for field-installed equipment as specified herein. Power wiring and conduit shall conform to the requirements specified herein. Control wiring shall be provided under, and conform to the requirements of the section specifying the associated equipment.

2.14 MOTOR CONTROLLERS

A. Provide motor controllers in accordance with the following:
   1. UL 508, NEMA ICS 1, and NEMA ICS 2.
   2. Controllers shall have thermal overload protection in each phase and shall have one spare normally open and one spare normally closed auxiliary contact.
   3. Provide controllers for motors rated 1HP and above with electronic phase-voltage monitors designed to protect motors from phase-loss, undervoltage, and overvoltage.

4. Provide protection for motors from immediate restart by a time adjustable restart relay.
5. Magnetic-type motor controllers shall have undervoltage protection when used with momentary-contact pushbutton stations or switches and shall have undervoltage release when used with maintained-contact pushbutton stations or switches.
6. When used with pressure, float, or similar automatic-type or maintained-contact switch, controller shall have hand/off/automatic selector switch.
7. Connections to selector switch shall be such that only normal automatic regulatory control devices are bypassed when switch is in “hand” position.
8. Safety control devices, such as low and high pressure cutouts, high temperature cutouts, and motor overload protective devices, shall be connected in motor control circuit in “hand” and “automatic” positions.
9. Control circuit connections to hand/off/automatic selector switch or to more than one automatic regulatory control device shall be made in accordance with indicated or manufacturer’s approved wiring diagram.
10. For each motor not in sight of controller or where controller disconnecting means is not in sight of motor location and driven machinery location, controller disconnecting means shall be capable of being locked in open position. As an alternative, provide a manually operated, lockable, non-fused switch which disconnects motor from supply source within sight of motor.
11. Overload protective devices shall provide adequate protection to motor windings; be thermal inverse-time-limit type; and include manual reset-type pushbutton on outside of motor controller case.
12. Cover of combination motor controller and manual switch or circuit breaker shall be interlocked with operating handle of switch or circuit breaker so that cover cannot be opened unless handle of switch or circuit breaker is in “off” position.

B. Control Wiring:
   1. Provide control wiring in accordance with the following:
      a. All control wire shall be stranded tinned copper switchboard wire with 600-volt flame-retardant insulation Type SIS meeting UL 44, or Type MTW meeting UL 1063, and shall pass the VW-1 flame tests included in those standards.
      b. Hinge wire shall have Class K stranding.
      c. Current transformer secondary leads shall be not smaller than No. 10 AWG.
      d. The minimum size of control wire shall be No. 14 AWG.
      e. Power wiring for 480-volt circuits and below shall be of the same type as control wiring and the minimum size shall be No. 12 AWG.
      f. Special attention shall be given to wiring and terminal arrangement on the terminal blocks to permit the individual

conductors of each external cable to be terminated on adjacent terminal points.

C. Control Circuits:
1. Control circuits shall have maximum voltage of 120 volts derived from control transformer in same enclosure. Transformers shall conform to UL 506, as applicable. Transformers, other than transformers in bridge circuits, shall have primaries wound for voltage available and secondaries wound for correct control circuit voltage. Size transformers so that 80 percent of rated capacity equals connected load. Provide disconnect switch on primary side. [Provide fuses in each ungrounded primary feeder]. One secondary lead shall be fused; other shall be grounded.

D. Enclosures for Motor Controllers: NEMA ICS 6.

E. Pushbutton Stations: Provide with “start/stop” momentary contacts having one normally open and one normally closed set of contacts, and red lights to indicate when motor is running. Stations shall be heavy duty, oil-tight design.

2.15 LOCKOUT REQUIREMENTS

A. Provide disconnecting means capable of being locked out for machines and other equipment to prevent unexpected startup or release of stored energy in accordance with 29 CFR 1910.147. Mechanical isolation of machines and other equipment shall be in accordance with requirements of DIVISION 15 - MECHANICAL.

2.16 TELECOMMUNICATIONS RACEWAY DISTRIBUTION SYSTEM

A. Provide a system of telecommunications cable-supporting structures, including conduits with pull wires, open supports, terminal boxes, outlet and junction boxes, and other accessories as required, to complete the raceway system in accordance with TIA-569.

B. Outlet Boxes for Telecommunications System: Provide standard type 4-11/16 inches square by 2-1/8 inches deep. Depth of boxes shall be large enough to allow manufacturers’ recommended conductor bend radii.

C. Cover Plates: Blank device cover plate of finish specified for receptacles and switch cover plates.

D. Conduit Sizing: Unless otherwise indicated, conduit for single outlets shall be a minimum of one inch. Size conduits for horizontal distribution and risers to cabinets, junction boxes, distribution center, and telecommunications service, as indicated.

2.17 MANUFACTURER'S NAMEPLATE

A. Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

2.18 FIELD FABRICATED NAMEPLATES

A. Provide field fabricated nameplates in accordance with the following:
   1. ASTM D709.
   2. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified or as indicated on the drawings.
   3. Each nameplate inscription shall identify the function and, when applicable, the position.
   4. Nameplates shall be melamine plastic, 0.125 inch thick, white with red center core.
   5. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core.
   6. Minimum size of nameplates shall be one inch by 2.5 inches.
   7. Lettering shall be a minimum of 0.25 inch high normal block style.

2.19 WARNING SIGNS

A. Provide warning signs for flash protection in accordance with NFPA 70E and NEMA Z535.4 for panelboards and industrial control panels in other than dwelling occupancies and are likely to require examination, adjustment, servicing, or maintenance while energized. Provide field installed signs to warn qualified persons of potential electric arc flash hazards when warning signs are not provided by the manufacturer. The marking shall be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

2.20 FIRESTOPPING MATERIALS

A. Provide firestopping around electrical penetrations. Utilize UL-listed firestopping systems or assemblies suitable for the penetration being sealed.

2.21 FACTORY APPLIED FINISH

A. Provide factory-applied finish on electrical equipment in accordance with the following:
   1. NEMA 250 corrosion-resistance test and the additional requirements as specified herein.
   2. Interior and exterior steel surfaces of equipment enclosures shall be thoroughly cleaned and then receive a rust-inhibitive phosphatizing or equivalent treatment prior to painting.

3. Exterior surfaces shall be free from holes, seams, dents, weld marks, loose scale or other imperfections.
4. Interior surfaces shall receive not less than one coat of corrosion-resisting paint in accordance with the manufacturer's standard practice.
5. Exterior surfaces shall be primed, filled where necessary, and given not less than 2 coats baked enamel with semi-gloss finish.
6. Equipment located indoors shall be ANSI Light Gray.
7. Provide manufacturer's coatings for touch-up work and as specified in item entitled "FIELD APPLIED PAINTING" hereinbelow.

2.22 HARDWARE, SUPPORTS, BACKING, ETC.

A. Provide all hardware, supports, backing and other accessories necessary to install electrical equipment. Wood materials shall be treated against termites, iron or steel materials shall be galvanized for corrosion protection, and non-ferrous materials shall be brass or bronze. Provide other specialty materials where indicated.

B. Bolts, nuts, washers, and screws used for exterior use shall be high quality stainless steel or brass.

2.24 SUPPORT HANGERS FOR LIGHTING FIXTURES IN SUSPENDED CEILINGS

A. Wires: ASTM A641/A641M, galvanized regular coating, soft temper, 0.11 inches in diameter (12 gage) or galvanized, braided steel, minimum 0.08 inches in diameter.

B. Wires, for Humid Spaces:
1. ASTM A580/A580M, composition 302 or 304, annealed stainless steel 0.11 inches in diameter (12 gage).
2. ASTM B164, UNS NO4400, annealed nickel-copper alloy 0.11 inches in diameter (12 gage).

C. Rods: Threaded steel rods, 3/16 inch diameter, zinc or cadmium coated.

D. Straps: Galvanized steel, one by 3/16 inch, conforming to ASTM A653/A653M, with a light commercial zinc coating or ASTM A1008/A1008M with an electrodeposited zinc coating conforming to ASTM B633, Type RS.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Electrical installations, including weatherproof and hazardous locations and ducts, plenums and other air-handling spaces, shall conform to

requirements of NFPA 70 and IEEE C2 and to requirements specified herein.

B. Hazardous Locations: Work in hazardous locations, as defined by NFPA 70, shall be performed in strict accordance with NFPA 70 for particular "Class," "Division," and "Group" of hazardous locations involved. Provide conduit and cable seals where required by NFPA 70. Conduit shall have tapered threads.

C. Wiring Methods: Provide insulated conductors installed in rigid steel conduit, IMC, rigid nonmetallic conduit, or EMT, except where specifically indicated or specified otherwise or required by NFPA 70 to be installed otherwise. Utilize non-wax type lubricants for pulling, chemically neutral to insulation and sheath. Mechanical means for pulling to be tongue-limiting type and not be used for #2 AWG wires and smaller. Grounding conductor shall be separate from electrical system neutral conductor. Provide insulated green equipment grounding conductor for circuit(s) installed in conduit and raceways. Minimum conduit size shall be 3/4 inch in diameter for low voltage lighting and power circuits. Conduit which penetrates fire-rated walls, fire-rated partitions, or fire-rated floors shall be firestopped.
   1. Pull Wire: Install pull wires in empty conduits. Pull wire shall be plastic having minimum 200-pound force tensile strength. Leave minimum 36 inches of slack at each end of pull wire.
   2. Metal Clad Cable: Install in accordance with NFPA 70, Type MC cable.

D. Conduit Installation: Unless indicated otherwise, conceal conduit under floor slabs and within finished walls, ceilings, and floors. Keep conduit minimum 6 inches away from parallel runs of flues and steam or hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit will be visible after completion of project.
   1. Restrictions Applicable to EMT:
      a. Do not install underground.
      b. Do not encase in concrete, mortar, grout, or other cementitious materials.
      c. Do not use in areas subject to severe physical damage including but not limited to equipment rooms where moving or replacing equipment could physically damage the EMT.
      d. Do not use in hazardous areas.
      e. Do not use outdoors, including under open-sided covered lanais, patios, walkways or other similar locations.
      f. Do not use exposed below +8 feet above the finished floor, except in dedicated Electrical Rooms.
   2. Restrictions Applicable to Nonmetallic Conduit:
      a. PVC Schedule 40:
         1) Do not use in areas where subject to severe physical damage, including but not limited to, mechanical

equipment rooms, electrical equipment rooms, and other such areas.

2) Do not use in hazardous (classified) areas.

3) Do not use in penetrating fire-rated walls or partitions, or fire-rated floors.

4) Do not use above grade, except where conduit is concealed and located within walls up to the first outlet box or conduit coupling above the finished floor unless indicated otherwise.

3. Restrictions Applicable to Flexible Conduit: Use only as specified in subparagraph entitled “Flexible Connections” hereinbelow.
4. Conduit through Floor Slabs: Where conduits rise through floor slabs, curved portion of bends shall not be visible above finished slab.
5. Stub-Ups: Provide conduits stubbed up through concrete floor for connection to free-standing equipment with adjustable top or coupling threaded inside for plugs, set flush with finished floor. Extend conductors to equipment in rigid steel conduit, except that flexible metal conduit may be used 6 inches above floor. Where no equipment connections are made, install screwdriver-operated threaded flush plugs in conduit end.
6. Conduit Support: Support conduit by pipe straps, wall brackets, hangers, or ceiling trapeze. Fasten by wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; and by machine screws, welded threaded studs, or spring-tension clamps on steel work. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. Load applied to fasteners shall not exceed 1/4 proof test load. Fasteners attached to concrete ceiling shall be vibration resistant and shock-resistant. Holes cut to depth of more than 1-1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete joints shall not cut main reinforcing bars. Fill unused holes. In partitions of light steel construction, use sheet metal screws. In suspended-ceiling construction, run conduit above ceiling. Do not support conduit by ceiling support system. Conduit and box systems shall be supported independently of both (a) tie wires supporting ceiling grid system, and (b) ceiling grid system into which ceiling panels are placed. Supporting means shall not be shared between electrical raceways and mechanical piping or ducts. Installation shall be coordinated with above-ceiling mechanical systems to assure maximum accessibility to all systems. Spring-steel fasteners may be used for lighting branch circuit conduit supports in suspended ceilings in dry locations. Where conduit crosses building expansion joints, provide suitable expansion fitting that maintains conduit electrical continuity by bonding jumpers or other means. For conduits greater than 2-1/2 inches inside diameter, provide supports to resist forces of 0.5 times the equipment weight in any direction and 1.5 times the equipment weight in the downward direction.

7. Directional Changes in Conduit Runs: Make changes in direction of runs with symmetrical bends or cast-metal fittings. Make field-made bends and offsets with hickey or conduit-bending machine. Do not install crushed or deformed conduits. Avoid trapped conduits. Prevent plaster, dirt, or trash from lodging in conduits, boxes, fittings, and equipment during construction. Free clogged conduits of obstructions.
8. Locknuts and Bushings: Fasten conduits to sheet metal boxes and cabinets with 2 locknuts where required by NFPA 70, where insulated bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, use at least minimum single locknut and bushing. Locknuts shall have sharp edges for digging into wall of metal enclosures. Install bushings on ends of conduits, and provide insulating type where required by NFPA 70.
9. Flexible Connections: Provide flexible steel conduit between 3 feet and 6 feet in length for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for motors. Install flexible conduit to allow 20 percent slack. Minimum flexible steel conduit size shall be 1/2 inch diameter. Provide liquid-tight flexible conduit in wet and damp locations for equipment subject to vibration, noise transmission, movement or motors. Provide separate ground conductor across flexible connections.
10. Telecommunications System Pathway: Install telecommunications pathway in accordance with TIA-569
    a. Horizontal Pathway: Telecommunications pathways from the work area to the telecommunications room shall be installed and cabling length requirements in accordance with TIA-568-C.1. Size conduits in accordance with TIA-569 and as indicated.

E. Telecommunications Cable Support Installation: Install open top cable supports on 4 feet to 5 feet centers to adequately support and distribute the cable's weight. These types of supports shall be used to support a maximum of fifty 0.25 inch diameter cables. Install suspended cables with at least 3 inches of clear vertical space above the ceiling tiles and support channels (T-bars). Open top cable supports shall be suspended from or attached to the structural ceiling or walls with hardware or other installation aids specifically designed to support their weight.

F. Boxes, Outlets, and Supports: Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways shall be cast-metal, hub-type when located in wet locations, when surface mounted on outside of exterior surfaces, when surface mounted on interior walls exposed up to 8 feet above floors and walkways, or when installed in hazardous areas and when specifically indicated. Boxes in other locations shall be sheet steel, except that nonmetallic boxes may be used with nonmetallic conduit system. Each box shall have volume

required by NFPA 70 for number of conductors enclosed in box. Boxes for mounting lighting fixtures shall be minimum 4 inches square, or octagonal, except that smaller boxes may be installed as required by fixture configurations, as approved. Provide gaskets for cast-metal boxes installed in wet locations and boxes installed flush with outside of exterior surfaces. Provide separate boxes for flush or recessed fixtures when required by fixture terminal operating temperature; fixtures shall be readily removable for access to boxes unless ceiling access panels are provided. Support boxes and pendants for surface-mounted fixtures on suspended ceilings independently of ceiling supports. Fasten boxes and supports with wood screws on wood, with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel. Threaded studs driven in by powder charge and provided with lockwashers and nuts [or nail-type nylon anchors] may be used in lieu of wood screws, expansion shields, or machine screws. In open overhead spaces, cast boxes threaded to raceways need not be separately supported except where used for fixture support; support sheet metal boxes directly from building structure or by bar hangers. Where bar hangers are used, attach bar to raceways on opposite sides of box, and support raceway with approved-type fastener maximum 24 inches from box. When penetrating reinforced concrete members, avoid cutting reinforcing steel.

1. Pull Boxes: Construct of at least minimum size required by NFPA 70 of code-gauge galvanized sheet steel or stainless steel where indicated, except where cast-metal boxes are required in locations specified herein. Provide boxes with screw-fastened covers. Where several feeders pass through common pull box, tag feeders to indicate clearly electrical characteristics, circuit number, and panel designation.
2. Extension Rings: Extension rings are not permitted for new construction. Use only on existing boxes in concealed conduit systems where wall is furred out for new finish.

G. Mounting Heights: Mount panelboards, circuit breakers, motor controllers and disconnecting switches so height of operating handle at its highest position is maximum 78 inches above floor. Mount lighting switches 48 inches above finished floor. Mount receptacles and telecommunications outlets 18 inches above finished floor, unless otherwise indicated. Mount other devices as indicated. Measure mounting heights of wiring devices and outlets to center of device or outlet, unless otherwise indicated.

H. Lighting Fixtures: Set lighting fixtures plumb, square, and level with ceiling and walls, in alignment with adjacent lighting fixtures, and secure in accordance with manufacturers' directions and approved drawings. Installation shall meet requirements of NFPA 70. Mounting heights specified or indicated shall be to the bottom of fixture for ceiling-mounted fixtures and to center of fixture for wall-mounted fixtures. Obtain approval of the exact mounting for lighting fixtures on the job before commencing installation and, where applicable, after coordinating with the type, style, and pattern of the ceiling being installed. Recessed and semi-recessed

fixtures shall be independently supported from the building structure by a minimum of 4 wires or threaded rods per fixture and located near each corner of each fixture. Ceiling grid clips are not allowed as an alternative to independently supported light fixtures. Round fixtures or fixtures smaller in size than the ceiling grid shall be independently supported from the building structure by a minimum of 4 wires or threaded rods per fixture spaced approximately equidistant around the fixture. Do not support fixtures by ceiling acoustical panels. Where fixtures of sizes less than the ceiling grid are indicated to be centered in the acoustical panel, support such fixtures independently and provide at least two 3/4 inch metal channels spanning, and secured to, the ceiling tees for centering and aligning the fixture. Provide wires or threaded rods for lighting fixture support in this section.

I. Conductor Identification: Provide conductor identification within each enclosure where tap, splice, or termination is made. For conductors No. 6 AWG and smaller diameter, color coding shall be by factory-applied, color-impregnated insulation. For conductors No. 4 AWG and larger diameter, color coding shall be by plastic-coated, self-sticking markers; colored nylon cable ties and plates; or heat shrink-type sleeves. Identify control circuit terminations in accordance with manufacturer's recommendations.

J. Splices: Make splices in accessible locations. Make splices in conductors No. 10 AWG and smaller diameter with insulated, pressure-type connector. Make splices in conductors No. 8 AWG and larger diameter with solderless connector, and cover with insulation material equivalent to conductor insulation.

K. Covers and Device Plates: Install with edges in continuous contact with finished wall surfaces without use of mats or similar devices. Plaster fillings are not permitted. Install plates with alignment tolerance of 1/16 inch. Use of sectional-type device plates are not permitted. Provide gasket for plates installed in wet locations.

L. Electrical Penetrations: Openings around electrical penetrations (such as conduit penetrations or flush mounted equipment enclosures or junction boxes) through fire resistance-rated walls, partitions, floors, or ceilings shall be sealed to maintain fire resistive integrity. Use 3M CP25, Type MPP moldable putty or equivalent material or assemblies to maintain fire resistive integrity for conduit penetration and flush mounted outlet boxes. Use other approved construction methods for larger enclosures.

M. Grounding and Bonding: Provide in accordance with NFPA 70. Ground exposed, non-current-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in metallic and nonmetallic raceways, telecommunications system grounds, and neutral conductor of wiring systems.

1. Grounding Connections: Make grounding connections which are buried or otherwise normally inaccessible, by exothermic weld or compression connector.
   a. Make exothermic welds strictly in accordance with the weld manufacturer's written recommendations. Welds which are "puffed up" or which show convex surfaces indicating improper cleaning are not acceptable. Mechanical connectors are not required at exothermic welds.
   b. Make compression connections using a hydraulic compression tool to provide the correct circumferential pressure. Tools and dies shall be as recommended by the manufacturer. An embossing die code or other standard method shall provide visible indication that a connector has been adequately compressed on the ground wire.
2. Resistance: Maximum resistance-to-ground of grounding system shall not exceed 25 ohms under dry conditions. Where resistance obtained exceeds 25 ohms, contact Engineer for further instructions.

N. Equipment Connections: Provide power wiring for the connection of motors and control equipment under this section of the specification. Except as otherwise specifically noted or specified, automatic control wiring, control devices, and protective devices within the control circuitry are not included in this section of the specifications but shall be provided under the section specifying the associated equipment.

O. Seismic Bracing: Contractor shall provide seismic bracing for all electrical equipment, apparatus, and raceways. Bracing shall, as a minimum, comply with the County Building Code.

P. Repair of Existing Work: Repair of existing work, demolition, and modification of existing electrical distribution systems shall be performed as follows:
   1. Workmanship: Lay out work in advance. Exercise care where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, or other surfaces is necessary for proper installation, support, or anchorage of conduit, raceways, or other electrical work. Repair damage to buildings, piping, and equipment using skilled craftsmen of trades involved.
   2. Existing Concealed Wiring to be Removed: Existing concealed wiring to be removed shall be disconnected from its source. Remove conductors; cut conduit flush with floor, underside of floor, and through walls; and seal openings.
   3. Removal of Existing Electrical Distribution System: Removal of existing electrical distribution system equipment shall include equipment's associated wiring, including conductors, cables, exposed conduit, surface metal raceways, boxes, and fittings, back to equipment's power source as indicated.
   4. Continuation of Service: Maintain continuity of existing circuits of equipment to remain. Existing circuits of equipment shall remain energized. Circuits which are to remain but were disturbed during

demolition shall have circuits wiring and power restored back to original condition.

3.02 FIELD FABRICATED NAMEPLATE MOUNTING

A. Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of 2 sheet-metal screws or 2 rivets.

3.03 WARNING SIGN MOUNTING

A. Provide the number of signs required to be readable from each accessible side. Space the signs in accordance with NFPA 70E.

3.04 FIELD APPLIED PAINTING

A. Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Where field painting of enclosures for panelboards, load centers or the like is specified to match adjacent surfaces, to correct damage to the manufacturer's factory applied coatings, or to meet the indicated or specified safety criteria, provide manufacturer's recommended coatings and apply in accordance to manufacturer's instructions. Painting shall be as specified in SECTION 09901 - PAINTING.

3.05 FIELD QUALITY CONTROL

A. Furnish test equipment and personnel and submit written copies of test results. Give Engineer 10 working days' notice prior to each.
   1. Devices Subject to Manual Operation: Each device subject to manual operation shall be operated at least 5 times, demonstrating satisfactory operation each time.
   2. 600-Volt Wiring Test: Test wiring rated 600 volt and less to verify that no short circuits or accidental grounds exist. Perform insulation resistance tests on wiring No. 6 AWG and larger diameter using instrument which applies voltage of approximately 500 volts to provide direct reading of resistance. Minimum resistance shall be 250,000 ohms. Submit results to the Engineer.
   3. Transformer Tests: Measure primary and secondary voltages for proper tap settings.
   4. Ground-Fault Receptacle Test: Test ground-fault receptacles with a "load" (such as a plug in light) to verify that the "line" and "load" leads are not reversed.
   5. Grounding System Test: Test grounding system to ensure continuity and that resistance to ground is not excessive.

END OF SECTION

SECTION 16483 - Variable Frequency Drive Control

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes variable frequency drive controllers and accessories as required for packaged equipment applications and where shown and scheduled on the Drawings.

B. Variable frequency drive controllers for all mechanical equipment shall be from the same manufacturer throughout the project.

1.02 SUBMITTALS

A. Provide submittals in accordance with provisions of Division 1.

B. Provide manufacturer's published product and technical data, recommended installation and operating instructions, physical characteristics, including weights, UL Listing, standard diagnostic and testing procedures for field operation and trouble-shooting, and maintenance and repair data per Division 1.

C. Manufacturer's staff application engineer shall state compliance, or detailed explanation of noncompliance, with these Specifications.

D. Submit certified test reports of factory testing of prototype and sample factory test reports on units comparable to those specified for this Project.

E. Prior to installation, the VFD manufacturer shall provide calculations, specific to this installation, showing voltage total harmonic distortion is less than 3 percent and current total harmonic distortion is less than 5 percent. Input line filters shall be sized and provided as required by VFD manufacturer to ensure compliance with IEEE standard 519-1992, Guide for Harmonic Control. The acceptance of this calculation must be completed prior to VFD installation.

1.03 OPERATIONAL AND MAINTENANCE MANUALS

A. Provide operational and maintenance manuals per Section 15010 Mechanical General Requirements

1.04 FACTORY TESTING

A. VFD factory testing shall be performed on all units and certified test reports shall be delivered to the Architect within 10 days of factory tests and prior to delivery of equipment to Site. Motor noise as a result of the variable frequency drive system at any operational speed shall be limited to 3 dBA above across-the-line operation noise, measured at 3 feet from the motor center line. Test reports to be legibly signed by application engineer of manufacturer, and those conducting, witnessing, or approving tests. Architect to be advised of test 15 days prior to test.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

A. ABB

B. Danfoss

C. All VFD's on this project provided under various bid packages shall be by the same manufacturer to provide uniformity.

2.02 GENERAL

A. Coordinate with Section 15058 Common Motor Requirements for HVAC Equipment.

B. Components shall be UL listed and labeled.

C. Materials and equipment shall be standard products of manufacturer regularly engaged in production of same. Where more than 1 unit of an item is required, all shall be by same manufacturer. Manufacturer's nameplate indicating model number, serial number, and performance data shall be permanently affixed to equipment. Equipment shall be manufacturer's latest model and not currently scheduled for obsolescence.

D. Materials and equipment shall be new and in perfect condition. Except as otherwise specified, materials shall be in accordance with standard specifications of American Society of Testing Material, National Electrical Code, or other agency or code-enforcing authority having jurisdiction.

E. Equipment design, internal supports, testing, etc., shall comply with industry standards, inspecting or testing agencies, and NFPA regulations.

F. Variable frequency drive shall be provided with integration communication card for building management system which communicate via Bacnet protocol. The existing DDC system is by Trane Tracer Summit.

2.03 SYSTEM DESCRIPTION

A. Variable frequency drive controller shall consist of full-wave converter, DC link, and power transistorized inverter section to control single motor or multiple as indicated on plans. Silicon controlled rectifiers are not acceptable; motor overload protection shall be inherent in unit.

B. VFD shall be self-protecting against any malfunction of driven load, its wiring, or inadvertent operation, such as, but not limited to:

1. Motor disconnected while operating.

2. Motor closed-in on energized drive, whether motor is coasting (in either direction) or standing still.

3. Motor single-phasing.

4. Short-circuited open or grounded wiring in or to motor.

2.04 CONSTRUCTION

A. General: Controller shall be totally enclosed, dead front, wall mounted or free-standing assembly.

B. Variable frequency drive controller (or VFC) shall be of sufficient capacity and provide quality of output waveform so as to achieve full rated output on motors.

1. Minimum efficiency 96 percent at 100 percent speed, and 90 percent at 20 percent speed.

2. Rated Input Voltage: 460 volts “10 percent, 60 Hz “2 Hz, without use of step-up/down transformers. -

3. Ambient Temperature Range: Minus 10 degrees C. Provide, closed loop air conditioner if required.

4. Altitude Rating: Up to 3,000 ft above sea level without derating.

5. Service Factor: 1.0, at drive’s rated line voltage.

6. Power Unit Rating Basis: Continuous rated current at rated speed and voltage.

C. The entire VFD shall have a withstand short circuit rating of 65,000 rms symmetrical amperes minimum, and higher rating as indicated on the electrical drawing. Breaker shall be mechanically interlocked with power unit enclosure door, padlockable, with defeat capability. Except for incoming line terminals on circuit disconnect device, there shall be no live power within unit with circuit disconnect opened.

D. Worst case RMS motor line current measured at rated speed, torque, and voltage shall not exceed 1.05 RMS current for pure sine wave operation. Pulse train frequency from inverter shall be field adjustable from 3 kHZ to 16 kHZ.

E. Pulse train (carrier) frequency shall be field adjustable from 3 kHz to 12 kHz.

F. Input signals shall have optically coupled isolators. Output shall be sinusoidal pulse width modulated voltage waveform. System shall include necessary control circuits, synchronizing equipment, and protective devices. System protection shall provide following:

1. Current limit.

2. Overcurrent: 170 percent instantaneous electric trip; with trip indication.

3. Short Circuit: Phase-to-phase and phase-to-ground trip without damage to unit; provide trip identification.

4. Overvoltage: High DC bus voltage trips fault, with trip indication.

5. Undervoltage: 20 percent below line voltage causes trip; provide trip indication.

6. Automatic Restart: After power interruption, unit shall reset and restart, per input control signal, and pick up coasting or stopped motor without additional delay.

7. Burn-Out: DC bus fuse protection or 3-phase input fusing.

8. Power unit over-temperature protection.

9. Digital Indication: Overvoltage, undervoltage, overcurrent, overheating, LED indication to indicate capacitor charge.

G. VFD shall include responsive action to motor winding temperature detectors or thermostatic switches, where indicated or required.

H. Provide timed linear acceleration and deceleration function adjustable from 6 to 60 seconds.

I. Units shall be enclosed in a sheet metal or high-density plastic housing of NEMA 1 (or as indicated or required) construction. Door shall include:

1. Input circuit breaker handle.

2. Manual speed control potentiometer.

3. HAND-OFF-AUTO selector switch.

4. Speed/frequency indicating meter, 0-100 percent/0-60 Hz.

5. Elapsed time meter, reading to tenths of hours.

6. Meter to directly read volts and amperes.

7. RUN, STOP, FAULT pilot lights.

8. KW output.

J. Input signal shall be coordinated with control requirements as shown and specified. Provide signal isolators, etc., as required to accept control signal.

K. Following conditions shall cause orderly shutdown:

1. Loss of input power.

2. Undervoltage.

3. Sustained overload.

4. In by-pass only, sustained overload by means of manually resettable thermal-overload relay.

L. Diagnostic and Testing Procedure: Submit manufacturer's standard diagnostic and testing procedure for diagnosing and troubleshooting.

M. Provide ramp to stop.

N. Maximum starting current shall not exceed 150 percent of motor full load current.

O. Isolation between drives shall not be required to maintain proper operation of drives.

P. Provide control power transformer, size as required, with primary and secondary fuse protection.

Q. Provide 3-element motor overload relay with thermal elements sized for motor running protection in both normal and in by-pass operation.

R. Contractor shall furnish necessary additional equipment as required if unit is supplied with closed-loop air-conditioner to maintain ambient temperature range.

S. Provide surge suppressor on electromagnetic contactors.

T. Provide coated, printed circuit boards.

U. Minimum and maximum speed control set points, internal field-adjustable.

V. Data link module RS232C or RS-485.

W. Microprocessor based Bypass Controller manual or automatic (selectable) transfer to line power via contactors. A keypad to control the bypass controller is to be mounted on the enclosure door. The bypass keypad shall include a one line to be mounted on the enclosure door. The bypass keypad shall include a one-line diagram and status LED's to indicate mode of operation, drive and bypass status and ready and enable conditions. When in the "Drive" mode, the bypass contactor is open, and the drive output contactor is closed. In the "Bypass" position, the drive output contactor is open, and the bypass contactor is closed via Start/Stop command. Start/Stop via customer supplied maintained contact shall be 24 V or 115 V compatible and shall function in both the "Drive" and "Bypass" modes. The voltage tolerance of the bypass power supply shall be +301-35% to eliminate the problem of contactor coil burnout. The design shall include single-phase protection in both the AFD and bypass modes.

1. Customer Interlock Terminal Strip: Provide a separate terminal strip for connection of freeze, fire, smoke contacts, and external start command. All external safety interlocks shall remain fully functional whether the system is in Hand, Auto, Drive or Bypass modes.

2. Automatic/manual bypass operation shall be selectable in the standard microprocessor-based bypass design.

3. Door/cover interlocked disconnect switch which will disconnect all input power from the drive, bypass and all internally mounted options. The disconnect handle shall be through the door and be padlockable in the "OFF' position.

4. Fast acting semi-conductor fuses exclusive to the AFD - fast acting semi-conductor fuses allow the API) to disconnect from the line prior to clearing upstream branch circuit protection, maintaining bypass capability. Bypass designs which have no such fuses, or diagram and status LEDs to indicate the mode of operation, drive and bypass status and ready and enable conditions. When in the "Drive" mode, the bypass contactor is open and the drive output contactor is closed. In the "Bypass" position, the drive output contactor is closed.

X. Each VFD shall be provided with filter/reactor to reduce the harmonics to the power line.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install variable frequency drive controllers for motors as indicated.

B. Floor mounted units shall be installed on concrete pads, 4 inches high and not more than 4 inches clear on all sides.

C. VFD manufacturer shall verify motor nameplate data to ensure compatibility of VFD and motor being used.

D. Verify properly sized overload elements, fuses, circuit breakers, etc., to protect controller, motor, and circuit components.

E. Provide required interlocking wiring between controller and motor disconnecting means, if required or indicated.

F. Manufacturer's local authorized representative shall inspect installation and assist in initial start-up, testing, and adjusting drive. Cooperate with automatic control system Contractor in adjusting and setting control.

3.02 FIELD TESTING AND DEMONSTRATING

A. Manufacturer's local authorized representative and installing contractor shall conduct manufacturer's recommended field tests to demonstrate operation, interlocking, and control of to units.

B. Manufacturer's representative shall submit letter to Architect stating tests conducted, results obtained, and certify installation meets requirements of manufacturer, that equipment warranties and guarantees are in full effect, and installation meets intent of Contract Documents.

3.03 WARRANTY

A. Warranty shall be for 12 months from the date of certified start-up. The warranty shall include all parts, labor, travel time, and expenses.

END OF SECTION

August 16, 2021

SECTION 16510 – INTERIOR LIGHTING

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes, but is not limited to, interior luminaires, lamps, ballasts, and emergency lighting units, and all required components and accessories.

1.02 RELATED WORK

A. SECTION 16011 - BASIC ELECTRICAL REQUIREMENTS applies to this section, with the additions and modifications specified herein.

B. SECTION 16100 - ELECTRICAL WORK applies to this section, with additions and modifications specified herein.

1.03 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications may be referred to in the text by the basic designation only. Unless otherwise indicated, most recent edition of the publication with current revisions and amendments will be enforced.

1. ASTM International (ASTM):

ASTM A580/A580M	(2013b) Standard Specification for Stainless Steel Wire
ASTM A641/A641M	(2009a) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM B164	(2003; R 2008) Standard Specification for Nickel-Copper Alloy Rod, Bar, and Wire

2. California Energy Commission (CEC):

CEC Title 24	(2008; Effective Jan 2010) California's Energy Efficiency Standards for Residential and Nonresidential Buildings

3. Institute of Electrical and Electronics Engineers (IEEE):

IEEE C2	(2012; Errata 2012; INT 1-4 2012; INT 5-7 2013) National Electrical Safety Code
IEEE C62.41.1	(2002; R 2008) Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits

IEEE C62.41.2	(2002) Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

4. National Electrical Manufacturers Association (NEMA):

ANSI ANSLG C78.41	(2006) For Electric Lamps: Guidelines for Low-Pressure Sodium Lamps
ANSI ANSLG C78.42	(2009) For Electric Lamps: High-Pressure Sodium Lamps
ANSI C78.1381	(1998) American National Standard for Electric Lamps - 250-Watt, 70 Watt, M85 Metal-Halide Lamps
ANSI C78.901	(2005) American National Standard for Electric Lamps - Single Base Fluorescent Lamps--Dimensional and Electrical Characteristics
ANSI C82.4	(2002) American National Standard for Ballasts for High-Intensity-Discharge and Low-Pressure Sodium (LPS) Lamps (Multiple-Supply Type)
ANSI/ANSLG C78.43	(2013) American National Standard for Electric Lamps - Single-Ended Metal-Halide Lamps
NEMA ANSLG C78.81	(2013) American National Standard for Electric Lamps--Double-Capped Fluorescent Lamps--Dimensional and Electrical Characteristics
NEMA ANSLG C78.377	(2011) Electric Lamps - Specifications for the Chromaticity of Solid State Lighting (SSL) Products
NEMA ANSLG C82.11	(2011) Lamp Ballasts - High-Frequency Fluorescent Lamp Ballasts
NEMA C136.10	(2010) American National Standard for Roadway and Area Lighting Equipment-Locking-Type Photocontrol Devices and Mating Receptacles--Physical and Electrical Interchangeability and Testing

NEMA ICS 2	(2000; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 6	(1993; R 2011) Enclosures

5. National Fire Protection Association (NFPA):

NFPA 101	(2012; Amendment 1 2012) Life Safety Code
NFPA 70	(2008) National Electrical Code
NFPA 90A	(2012) Standard for the Installation of Air Conditioning and Ventilating Systems

6. Underwriters' Laboratories (UL):

UL 1029	(1994; Reprint Dec 2013) High-Intensity-Discharge Lamp Ballasts
UL 1310	(2011) Class 2 Power Units
UL 1598	(2008; Reprint Oct 2012) Luminaires
UL 595	(1985) Marine-Type Electric Lighting Fixtures
UL 773	1995; Reprint Mar 2002) Standard for Plug-In, Locking Type Photocontrols for Use with Area Lighting
UL 773A	(2006; Reprint Nov 2013) Standard for Nonindustrial Photoelectric Switches for Lighting Control
UL 844	(2012) Standard for Luminaires for Use in Hazardous (Classified) Locations
UL 924	(2006; Reprint Feb 2011) Standard for Emergency Lighting and Power Equipment
UL 935	(2001; Reprint Dec 2013) Standard for Fluorescent-Lamp Ballasts

1.04 DESCRIPTION OF WORK

A. The work includes providing luminaires, switches, time switches, and other control devices, contactors, and battery-powered units and systems for interior use, including luminaires and accessories mounted on the exterior surfaces of buildings. Materials not normally furnished by

manufacturers of these devices are specified in SECTION 16100 - ELECTRICAL WORK.

1.05 SUBMITTALS

A. Data, shop drawings, and reports shall employ the terminology, classifications, and methods prescribed by the IES Lighting Handbook, as applicable, for the lighting system specified.
   1. Manufacturer's Data:
      a. Luminaires, including lamps and drivers
      b. Lighting control switches, including dimmer switches, three way switches, three way dimmer switches, three way occupancy switches, and dimmer occupancy sensor switches
      c. Touch Screen Lighting Control Keypads
      d. Emergency power inverters
      e. Lighting Control Panels
   2. Shop Drawings:
      a. Luminaire assemblies

1.06 OPERATIONS AND MAINTENANCE MANUAL

A. Submit operation and maintenance data showing all light fixtures, control modules, control zones, occupancy sensors, light level sensors, power packs, dimming ballasts, schematic diagrams and all interconnecting control wire, conduit, and associated hardware. Submit documentation that includes contact information, summary of procedures, and the limitations and conditions applicable to the project.

PART 2 - PRODUCTS

2.01 LED LIGHTING FIXTURES

A. Provide lighting fixtures specifically engineered for LED light sources and drivers. Use of linear or screw-base retrofit LED light sources is not acceptable. LED lighting fixtures shall carry a minimum warranty of five years.

B. LED Light Sources
   1. Correlated Color Temperature (CCT) shall be in accordance with NEMA ANSLG C78.377: Nominal CCT: 4000 degrees K unless otherwise specified.
   2. Color Rendering Index (CRI) shall be: Greater than or equal to 80 unless otherwise indicated.

C. Luminaire LED Power Supply Units (Drivers)
   1. LED Power Supply Units (Drivers): UL 1310. LED Power Supply Units (Drivers) shall meet the following requirements:
      a. Minimum efficiency shall be 80 percent.

b. Shall be designed to operate on the voltage system to which they are connected, typically ranging from 120 V to 480 V nominal.
c. Operating frequency shall be: 60 Hz.
d. Power Factor (PF) shall be greater than or equal to 0.90.
e. Total Harmonic Distortion (THD) current shall be less than or equal to 20 percent.
f. Shall be mounted integral to luminaire. Remote mounting of power supply is not allowed.
g. Power supplies in luminaires shall be UL listed with a sound rating of "A".
h. Shall be dimmable, and compatible with a standard dimming control circuit of 0 - 10V or other approved dimming system as indicated.

2.02 RECESS-AND FLUSH-MOUNTED FIXTURES

A. Provide type that can be relamped from the bottom. Access to ballast shall be from the bottom. Trim for the exposed surface of flush-mounted fixtures shall be as indicated. Delete thermal insulation immediately surrounding recessed luminaires.

2.03 EMERGENCY LIGHTING EQUIPMENT

A. UL 924, NFPA 70, and NFPA 101. Provide lamps in wattage indicated. Provide accessories required for remote-mounted lamps where indicated. Remote-mounted lamps shall be as indicated.
1. Emergency Lighting Unit: Provide as indicated. Emergency lighting units shall be rated for 12 volts, except units having no remote-mounted lamps and having no more than two unit-mounted lamps may be rated 6 volts. Equip units with brown-out sensitive circuit to activate battery when ac input falls to 75 percent of normal voltage.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Electrical installations shall conform to IEEE C2, NFPA 70, and to the requirements specified herein.

B. Lamps: Lamps of the type, wattage, and voltage rating indicated shall be delivered to the project in the original cartons and installed just prior to project completion. Lamps installed and used for working light during construction shall be replaced prior to turnover to the Owner if more than 15 percent of their rated life has been used. Lamps shall be tested for proper operation prior to turn-over and shall be replaced if necessary with new lamps from the original manufacturer. Provide 10 percent spare lamps of each type from the original manufacturer.

C. Lighting Fixtures: Set lighting fixtures plumb, square, and level with ceiling and walls, in alignment with adjacent lighting fixtures, and secure in accordance with manufacturers' directions and approved drawings. Installation shall meet requirements of NFPA 70. Mounting heights specified or indicated shall be to the bottom of fixture for ceiling-mounted fixtures and to center of fixture for wall-mounted fixtures. Obtain approval of the exact mounting for lighting fixtures on the job before commencing installation and, where applicable, after coordinating with the type, style, and pattern of the ceiling being installed. Recessed and semi-recessed fixtures shall be independently supported from the building structure by a minimum of four wires per fixture and located near each corner of each fixture. Ceiling grid clips are not allowed as an alternative to independently supported light fixtures. Do not support fixtures by ceiling acoustical panels. Where fixtures of sizes less than the ceiling grid are indicated to be centered in the acoustical panel, support such fixtures independently and provide at least two 3/4 inch metal channels spanning, and secured to, the ceiling tees for centering and aligning the fixture. Provide wires for lighting fixture support in this section.

D. Exit Lights and Emergency Lighting Units: Wire exit lights and emergency lighting units ahead of the switch to the normal lighting circuit located in the same room or area.

3.02 FIELD APPLIED PAINTING

A. Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria.

3.03 GROUNDING

A. Ground noncurrent-carrying parts of equipment as specified in SECTION 16100 - ELECTRICAL WORK. Where the copper grounding conductor is connected to a metal other than copper, provide specially treated or lined connectors suitable for this purpose.

3.04 FIELD TESTS

A. Operating Test: Upon completion of the installation, conduct an operating test to show that the equipment operates in accordance with the requirements of this section. Make adjustments and add and/or replace light fixtures and other equipment as required to correct deficiencies. Lighting level measurements shall be provided upon request and be made at intervals as directed by the Engineer and with a NIST calibrated cosine corrected photometer with a silicon photodiode.

B. Lighting Control Test: Conduct operational control of installed and energized luminaires.

C. Ground Resistance Tests: Perform as specified in SECTION 16100 - ELECTRICAL WORK.

END OF SECTION